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14. ABSTRACT: The Marine Corps' manpower costs are 60 percent of its annual budget. The Enlisted and Officer Strength Planners must develop plans, by paygrade and month, to meet endstrength requirements in the budget execution year and 6 out-years. To develop these plans, the planners must forecast endstrength losses and gains. This study focuses on doing this accurately. Inaccuracy results in finishing either the year above the congressionally mandated endstrength target (overspending the budget) or below the endstrength target (which has operational consequences). Previously, there was no institutionalized and documented methodology for forecasting losses and no systematic attempt to improve existing techniques. New planners relied on information gleaned during overlap with their predecessors and sometimes developed their own methods (which were susceptible to errors). They had few reference tools and no capability to run loss scenarios. We first assessed the existing loss forecasting processes. Then, we made the processes more systematic. Next, we improved/added to the loss forecasting model and created reference tools. Finally, we documented the entire process in detail. We recommend creating an SSN-based file, adding a civilian planner/consultant to the endstrength team, and waiting to hard-wire models until the planners are comfortable with the modified models and their methods.

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Endstrength: Forecasting Marine Corps Losses Final Report

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Contents

Executive summary

The Marine Corps' manpower costs are significant—about $9.4 billion, or almost 60 percent of the Marine Corps' annual budget. The Enlisted Strength Planners (MPP-20) and the Officer Inventory Planner (OIP) (MPP-30) must develop plans, by paygrade and month, to meet endstrength requirements in both the budget execution year and the out-years (6 years into the future). The execution year plans are generally developed in October, whereas the out-year plans are developed in the spring.

The fundamental endstrength equation is:

Beginning strength – Losses + Gains = Endstrength.

To develop the execution and out-year plans, the planners must forecast endstrength losses and gains. The accuracy of their forecasts is very important (particularly on the enlisted side) since inaccuracy results in either finishing the year above the congressionally mandated endstrength target (and overspending the budget[1]) or finishing the year below the endstrength target (which has operational consequences).

This study was initiated because of recognition of the importance of correctly forecasting endstrength losses and gains and the severe consequences of incorrect estimates. Estimates had been incorrect in the past due in part to the ad hoc nature of the loss forecasting processes. Previously, there was no institutionalized and documented methodology for forecasting losses and no systematic attempt to improve existing loss-forecasting techniques. New planners relied on information they gleaned during the overlap period with their predecessors and sometimes developed their own methods (which were susceptible to errors). They had few reference tools and no capability to run loss

1. In FY01–02, a $200-million mistake had to be taken out of O&M funds.

scenarios (for example, how higher-than-predicted losses next month would affect endstrength or whether Marine Corps Recruiting Command's accession guidance needed to be changed). Since enlisted losses dominate, the situation was most critical on the enlisted side.

Our approach was to first assess the existing loss forecasting processes. Then, we made the processes more systematic. Next, we improved/added to the loss forecasting model. Finally, we documented the endstrength management process.

To document the planners' existing processes, we worked very closely with the planners. One of CNA's top programmer-analysts worked with the enlisted strength planners at Quantico for 2 months to ensure a complete understanding of their models. We also met with the officer strength planner several times to learn about that model. Through these interviews, we better understood current processes, procedures, data categorizations, and data sources. We also interviewed endstrength planners in other Services to identify aspects that could be used to improve the Marine Corps' processes.

Over the course of our study, we made several improvements/additions to the planners' models. Where possible, we document these improvements. In some cases, however, we must take the model in its present incarnation as a starting point.

One of the first improvements we made to the enlisted endstrength model was to streamline it. Our programmer-analyst worked with the endstrength planners to create (a) logically organized and linked worksheets, (b) organized storage of historical plans and scenarios (work previously was overwritten when new scenarios were generated), and (c) a process checklist with data references and notes.

Next, we automated the endstrength management tool. Our programmer-analyst worked with planners to create an automated summary for the monthly endstrength reports, a one-step data weighting capability, the ability to experiment with data weights, and automated updating and strength plan creation (through the use of several new templates).

As we made improvements to the models, we identified several existing problems/inconsistencies that needed to be addressed. For example, we found instances of two desertion records without a return-from-desertion record in between. This inconsistency, which is due either to a missing return-from-desertion record or a duplicate desertion record, now is being investigated by the contractor who manages the Marine Corps' manpower data. We also found that historical loss data were being overwritten over time. Although this may be the result of data cleaning efforts, it is important for the endstrength planners to know when the data are being changed and what these changes are. Finally, our programmer-analyst helped the enlisted endstrength planners to develop a methodology that would better estimate the size of future End-of-Active Service (EAS) populations.

Next, we verified/restructured the loss categories. We determined that non-EAS (NEAS) attrition reasons are best forecast together, with the exception of recruit attrition and retirement. We recommended that deserter gains and losses (which are currently forecasted separately) might be forecast together as an alternate method. Finally, we recommended that officer losses be grouped differently for forecasting purposes: Self-initiated (retirements and resignations), EAS (releases), and natural losses (discharges and other).

We also highlighted cases in which different data could be used to forecast losses. After experimenting with several variables, we determined that data on planned retirements and the unemployment rate could improve retirement loss forecasts. We also linked the overall unemployment rate to the officer loss forecast to provide a check of the OIP's forecast procedures.

We then developed some methods the planners can use to forecast. On the enlisted side, we noted that recruit attrition currently is loaded entirely in the accession month and recommended that it be apportioned between the accession month and the next month. We also tried to construct an NEAS continuation rate but found that this was not feasible due to the presence of deserters. Finally, we suggested that the components of NEAS losses that currently are forecast as numbers instead be forecast as a share of mandated endstrength.

On the officer side, we suggested that the by-grade and type loss models be linked by using grade shares calculated in the by-grade loss model to distribute losses calculated in the type loss model. We also thought that weights for historical data could be varied, using the "significant events" database (a reference tool we developed), the optimization tool (another reference tool we developed based on an Air Force tool), or exponential smoothing. Finally, we noted that all losses (not just certain NEAS losses) are currently forecast as numbers and may be better forecast as a share of mandated endstrength—particularly as endstrength increases in the future.

Finally, we developed the capability to easily run loss scenarios (which were previously done using ad hoc methods). Strength planners frequently are asked to estimate the effect of such factors as war or unemployment on losses, or the effect of larger or smaller actual losses in the execution year. We developed a spreadsheet in which weights for historical data are easily varied, and changing data in a particular cell automatically computes new values.

Our recommendations include creating an SSN-based data file (so that individual Marines can be cross-referenced with gains/loss data from the planners' "cubes"), adding a civilian planner/consultant to the endstrength planning team (to provide continuity to the process over time), and waiting to hard-wire models until the planners are comfortable with the modified models and their methods.

Introduction

Background

Manpower costs are about $9.4 billion annually, or almost 60 percent of the Marine Corps' annual budget. The Enlisted Strength Planners (MPP-20) and the Officer Inventory Planner (MPP-30) develop plans, by paygrade and month, to meet endstrength requirements in both the budget execution year and the out-years (6 years into the future).[2] Although officer and enlisted strength planning are significantly different, both strive for accurate loss forecasting. The officer strength planner accesses to a structure requirement but relies on accurate loss forecasts for budgeting. The enlisted strength planner accesses based on forecasted losses to satisfy endstrength requirements.

Because the enlisted force is so much larger than the officer force, accurate enlisted loss forecasts are particularly important. If the enlisted loss forecast underestimates actual losses (meaning there are more losses than originally forecast), the number of accessions originally planned will be too low. If the enlisted loss forecast overestimates actual losses (meaning that there are fewer losses than originally forecast), the number of enlisted accessions originally planned will be too high, and the Marine Corps will overspend its budget. Both scenarios, which have serious adverse consequences for the Corps, have occurred in the past.

Thus, endstrength planners must forecast losses, by paygrade, in both the short and the long term as accurately as possible.[3] At the outset of

2. The FY+2 out-year forecast is used for budgeting purposes. The timing and use of forecasts is described further in the next section.

3. Certain categories of gains must be forecast because they are not controlled (e.g., gains for deserters who return to the Corps).

this study, there was no institutionalized and documented methodology for forecasting losses, so the accuracy of the forecast relied heavily on the particular Marines filling the strength planning billets. Furthermore, no one had made a systematic attempt to determine whether the current combination of methods and loss categorizations that strength planners use to forecast enlisted and officer losses could be improved. Finally, no structured capability existed to run loss scenarios (e.g., how might losses change if the mixture of years used for the weighted average is changed?).

Endstrength rules

Endstrength is the number of Servicemembers in a particular Service on the last day of the fiscal year, 30 September.[4] Title X allows each Service to exceed endstrength by 2 to 3 percent (2-percent discretion with SECNAV approval and 3-percent discretion with SECDEF approval). Currently, there is no tolerance for ending the fiscal year below mandated endstrength.

Rules also dictate the grade distribution of Servicemembers counting toward endstrength. No more than 3.5 percent of enlisted can be in grades E8 and E9, with a 1-percent restriction on those in E9. Current Marine Corps policy sets the maximum percentage of those who can be in the top six grades at 52.2 percent.[5] Similarly, the Defense Officer Personnel Management Act (DOPMA) dictates the grade distribution for officers in the ranks of O4 to O6.

The congressionally set endstrength target applies to the sum of active-duty Marine Corps officers and enlisted personnel. The Marine Corps, however, does endstrength planning, forecasting, and monitoring separately for officers and enlisted. This separation is needed because endstrength numbers are budgeted for a specific number of officers and enlisted personnel and the cost for an officer

4. The analysis and models that follow are based on this end-of-fiscal-year endstrength measure. If a proposal to move to average endstrength becomes law, parts of this analysis may need to be modified.

5. This was raised recently to 54 percent for FY06.

considerably exceeds the cost for an enlisted. However, September endstrength adjustments are made with enlisted accessions since they are more easily adjusted.

The fundamental endstrength equation is:

Beginning strength – Losses + Gains = Endstrength.

Because all calculations are done by fiscal year, the endstrength at the end of the previous fiscal year is the beginning strength of the next fiscal year.

This report

This study hopes to improve endstrength planning, forecasting, and monitoring processes. The study's emphasis is on improving loss forecasts. Because the processes differ significantly for officers and enlisted personnel, we analyze them separately.

In this report, we document how the Marine Corps' enlisted and officer strength planners do their work.[6] Appendix A describes the timelines for planning and budgeting. Appendix B describes Memo 01, which is distributed as accession planning guidance to Marine Corps Recruiting Command (MCRC) each September or October. We also describe the enlisted and officer strength planning processes in the other Services, which is included in appendices C through E.

We discovered areas for improvement in the process along the way; several of these changes already have been incorporated into our description of the current methodology. We also recommend additional changes or alternatives to the methodology, which could improve the accuracy of the endstrength planners' loss forecasts.

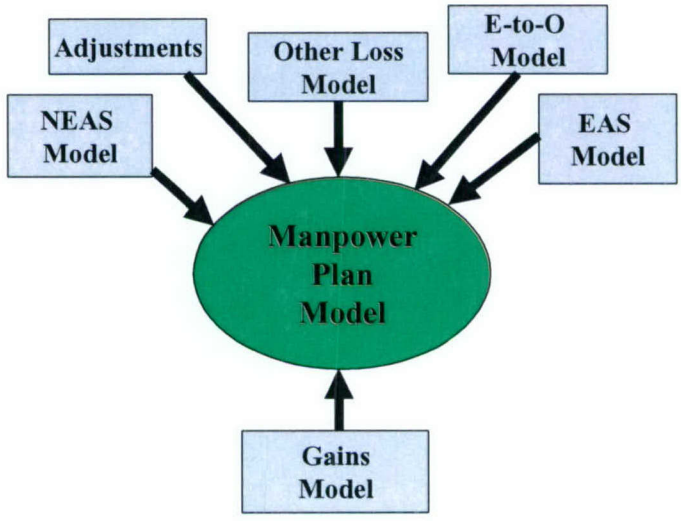
6. The endstrength process summarized in this report is one part of the manpower development process commonly referred to as "Manpower 101."

Enlisted Manpower Plan Model

Overview

Figure 1 shows the six main components of the Enlisted Manpower Plan Model: End-of-Active Service (EAS) Losses, Non-EAS (NEAS) Losses, Other Losses, Enlisted-to-Officer Losses/Gains, Gains, and Adjustments. All forecasts are made by month and grade.[7]

Figure 1. Marine Corps enlisted endstrength models[a]



a. Briefing from the Enlisted Strength planner.

7. Accuracy by month is more important than accuracy by grade. Appendix A describes the planning and budgeting timelines.

Although loss forecasting is the focus of our study, the enlisted endstrength planners also use these models in the endstrength management process. We summarize this process and its methods in appendix F.

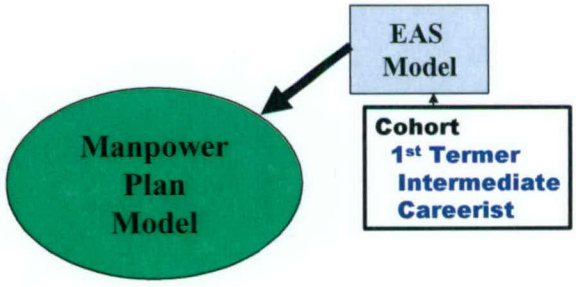
EAS Loss Model

Background

EAS losses account for over half of all active-duty enlisted losses (approximately 54 percent). Although theoretically easy to forecast, they traditionally have been the most difficult to predict.

As shown in figure 2, the Marine Corps divides EAS losses into first-term,[8] intermediate (3–13 years), and careerist (14–19 years).[9]

Figure 2. Marine Corps endstrength models: The EAS Model[a]



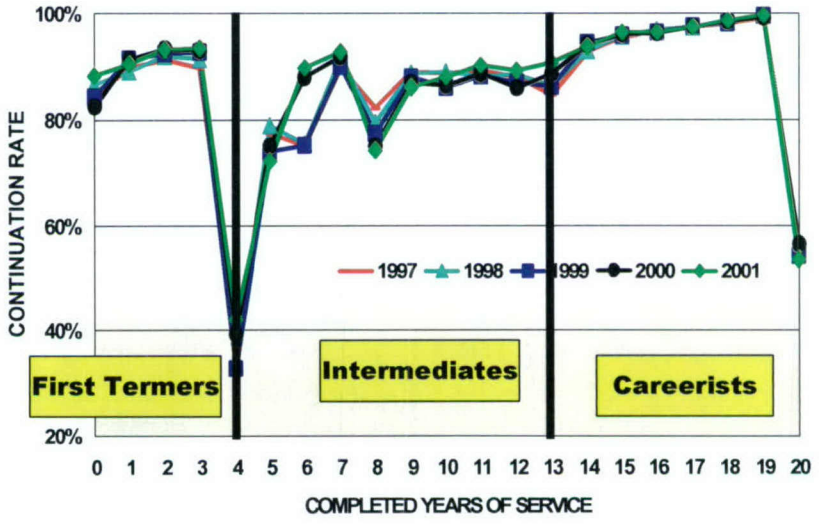
a. Briefing from the Enlisted Strength planners.

8. The first digit of the Source of Entry code for first-term losses is A or 1.
9. Those in the 20th year on are addressed in the retirement section.

There are several reasons for this division. First-term reenlistments are treated separately because the first-term alignment plan (FTAP) carefully controls the reenlistment of first-term Marines.[10] Careerists (those with 13 to 20 years of service) are treated separately because their continuation rates are both steady and very high—probably because of the lure of retirement. Intermediate-zone reenlistments are the final group. Reenlistment rates in this zone fluctuate the most from year to year, as economic conditions and the rewards of military service change.

Figure 3 shows continuation rates for Marines in these three zones, which are forecast by individual year of service (YOS). Currently, continuation rates are forecast based on a straight average of the previous three years' continuation rates.[11]

Figure 3. Fiscal year continuation rates by completed years of service[a]



a. Briefing from the Enlisted Strength planners.

10. For more information on the FTAP., see A.U. Hattiangadi et al., *Cost-Benefit Analysis of Lump Sum Zone A, Zone B, and Zone C Reenlistment Study: Final Report* (CNA Research Memorandum D0009652.A2/Final), Mar 2004.

11. We discuss the derivation of continuation rates in more detail later in this section.

First-term EAS losses

The Marine Corps uses the FTAP to manage first-term reenlistments. Using a steady-state model with some adjustments for current shortages and overages, the Marine Corps determines the required number of first-term reenlistments by primary occupational specialty (PMOS). Each requirement is a "boatspace," and recommended and eligible first-term Marines cannot reenlist without a boatspace. Manpower Policy (MP) produces the FTAP, and Manpower Management (MM) executes the policy. Thus, the strength planners know how many first-term reenlistments will be allowed. By looking at the number of first-termers coming to EAS and the number of boatspaces for reenlisters, the strength planners can determine the number of Marines who will separate at the end of the first term of service (see figure 4).[12]

Figure 4. First-term EAS model for FY04 (execution year)[a]

- FTAP is 5,900
  - MMEA caps
    - 100 extensions
    - 300 Tour II extensions
  - Double count projection (from EPS)
    - 200 in this year
- First-term stayers 5,900+100+300-200= 6,100

MONTH	Stayers	Leavers	Total
OCT	256	1,636	1,892
NOV	366	923	1,289
DEC	323	817	1,140
JAN	482	1,482	1,964
FEB	549	515	1,064
MAR	403	741	1,144
APR	348	610	958
MAY	427	1,048	1,475
JUN	763	2,197	2,960
JUL	799	2,444	3,243
AUG	726	1,987	2,713
SEP	641	1,865	2,506
Total	6,083	16,265	22,348

a. Briefing from the Enlisted Strength planners. MMEA is the Enlisted Assignment Branch. EPS is the Enlisted Plans Section (MPP-20).

12. Some Marines who separate would have liked to reenlist. First-term reenlistments, which are "first-come, first-served" for recommended and eligible Marines, open on the first day of the fiscal year. There are a small number of occupations that immediately have more applicants than there are boatspaces. In recent years, a board has been held in these cases to determine which Marines will be allowed to reenlist.

The last column of figure 4 shows the monthly number of first-term EASs for the execution year; the planners' job is to determine the number of EAS losses from the first-term EAS population (the total of the third column in figure 4). The strength planners start with the FTAP (in this example, 5,900 Marines). To that, they add the number of extensions MM will grant and the number of extensions beyond the end of the FY for Marines to complete deployments (Tour II extensions).[13] Double counts are prior-service Marines whom MCRC counted as continuous-service or broken-service enlistments but who are also counted in the FTAP. They are subtracted, and the result is the number of first-term Marines who will stay in the Corps (6,100 in this example).

To fill in figure 4, the strength planners must distribute the number of first-term stayers across the months in the stayers column. This is done by multiplying the stayer total by the share of the first-term reenlistment population that reenlisted in any given month, averaged over the past 3 years. Table 1 shows the reenlistment share for the last 3 years and the 3-year average.

Table 1. FTAP distribution used to distribute the number of first-term stayers monthly[a]

	FY01	FY02	FY03	FY04 pred
OCT	2.4%	4.4%	6.0%	4.2%
NOV	5.1%	6.1%	6.8%	6.0%
DEC	5.3%	5.3%	5.4%	5.3%
JAN	7.0%	7.8%	8.9%	7.9%
FEB	9.9%	8.1%	9.1%	9.0%
MAR	7.2%	6.6%	6.1%	6.6%
APR	5.9%	6.7%	4.6%	5.7%
MAY	6.6%	6.8%	7.6%	7.0%
JUN	13.2%	13.2%	11.3%	12.5%
JUL	13.5%	12.7%	13.2%	13.1%
AUG	12.9%	11.4%	11.5%	11.9%
SEP	11.0%	10.9%	9.6%	10.5%
Total	100.0%	100.0%	100.0%	100.0%

a. These numbers come from the data cubes.

13. The number of extensions is usually capped at 50 to 100. The number of Tour II extensions (which is usually capped at 250 to 300) will be significantly higher in the future since Tour II extensions are not capped in FY05.

For example in October, the 3-year average of rates is 4.2 percent, so the number of stayers in figure 4 is:

6,100 * 4.2% = 256.

The number of leavers is the difference between the monthly number of first-term EASs and the monthly number of stayers. In October, this count is:

1,892 - 256 = 1,636.

If the planners were forecasting EAS losses beyond the execution year, they would apply this distribution process to a first-term EAS population that had been corrected for pre-EAS attrition (described in a later section). The procedure, however, would be the same.

Intermediate-term and careerist EAS losses

Since all recommended and eligible Marines in the intermediate and careerist zones who want to reenlist are allowed to do so, the process for determining losses in these zones is different than that used in the first term.

Table 2 shows the population of intermediate zone Marines (those in YOS 3 to 14) in execution year FY04.[14] Currently, the strength planners use EAS continuous rates at YOS 4 to 14 to make intermediate zone projections, which are a straight average of 3 years of historical data (see table 3).[15] The continuation rates are applied to the EAS population (in the execution year) or the appropriately corrected EAS population (in the out-years).[16]

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14. Although previously defined as those from YOS 3 to 13, those in YOS 14 are actually split between the intermediate and careerist populations. These counts come from the Total Force Data Warehouse (TFDW).

15. There are very few intermediate-term EAS Marines in YOS 3 through 5 and, in fact, there probably should be none.

16. In the next section, we describe the way the EAS population is corrected in the out-years.

Table 2. Intermediate-term EAS population[a]

Month	3	4	5	6	7	8	9	10	11	12	13	14	SUM
OCT		5	23	119	456	131	48	32	59	40	17	2	932
NOV	2	3	10	35	157	97	39	31	63	37	24	2	500
DEC	4	5	8	25	118	98	35	29	45	48	12	2	429
JAN	3	5	7	17	152	136	60	43	53	58	22	7	563
FEB	1	7	8	13	147	152	52	42	38	49	25	5	539
MAR	3	1	2	3	204	155	51	42	54	53	22	9	599
APR	1	8	5	4	71	112	39	35	54	36	33	15	413
MAY	2	4		3	94	102	43	36	50	48	28	18	428
JUN	6	4	4	4	90	146	63	48	51	42	30	10	498
JUL	2	4	7	1	59	182	66	24	33	39	16	20	453
AUG	1	5	2	1	79	188	67	37	37	38	21	12	488
SEP	2	5	5	14	68	175	70	24	79	48	24	22	536
	27	56	81	239	1695	1674	633	423	616	536	274	124	6378

a. From the Enlisted Strength planners' spreadsheet model.

Table 3. Intermediate and careerist continuation rates

YOS	2001	2002	2003	Avg 01-03
4	45.83%	38.46%	35.71%	40.00%
5	30.43%	66.67%	31.58%	42.89%
6	46.15%	46.43%	52.44%	48.34%
7	37.56%	46.90%	45.86%	43.44%
8	38.03%	49.74%	53.17%	46.98%
9	47.98%	61.26%	59.62%	56.29%
10	52.06%	61.32%	65.29%	59.56%
11	64.53%	74.19%	75.65%	71.46%
12	74.86%	79.53%	82.74%	79.04%
13	72.46%	83.18%	80.73%	78.79%
14	73.33%	84.74%	87.86%	81.98%
15	84.39%	92.75%	91.63%	89.59%
16	91.19%	94.26%	94.39%	93.28%
17	94.83%	94.63%	96.21%	95.22%
18	96.10%	97.32%	97.27%	96.90%
19	98.97%	97.60%	99.63%	98.74%
20	83.03%	82.54%	87.08%	84.21%

For example, YOS 8 losses in October of the execution year are calculated as:

(1-.4698) * (932) * (131/932) = 69.46, or 69 Marines.

The first term in the equation is the EAS loss rate for those at YOS 8 (one minus the continuation rate reported in table 3), multiplied by

the total October EAS intermediate population[17] (see the sum column in table 2), multiplied by the October YOS 8 share of the October EAS intermediate population (also from table 2).[18] Table 4 shows the loss calculation for the intermediate zone.

Table 4. Intermediate loss calculation: Number of Marines lost[a]

Cont. rate	40.00%	42.89%	48.34%	43.44%	46.98%	56.29%	59.56%	71.46%	79.04%	78.79%	81.98%		
Month/YOS	4	5	6	7	8	9	10	11	12	13	14	Losses	Stayers
Oct	3.00	13.14	61.48	257.91	69.46	20.98	12.94	16.84	8.38	3.61	0.36	468	464
Nov	1.80	5.71	18.08	88.80	51.43	17.05	12.54	17.98	4.16	5.09	0.36	223	277
Dec	3.00	4.57	12.92	66.74	51.96	15.30	11.73	12.84	4.63	2.55	0.36	187	242
Jan	3.00	4.00	8.78	85.97	72.11	26.23	17.39	15.13	7.34	4.67	1.26	246	317
Feb	4.20	4.57	6.72	83.14	80.59	22.73	16.98	10.85	5.94	5.30	0.90	242	297
Mar	0.60	1.14	1.55	115.38	82.18	22.29	16.98	15.41	7.14	4.67	1.62	269	330
Apr	4.80	2.86	2.07	40.16	59.38	17.05	14.15	15.41	3.34	7.00	2.70	169	244
May	2.40	0.00	1.55	53.17	54.08	18.80	14.56	14.27	4.62	5.94	3.24	173	255
Jun	2.40	2.28	2.07	50.90	77.41	27.54	19.41	14.56	4.70	6.36	1.80	209	289
Jul	2.40	4.00	0.52	33.37	96.50	28.85	9.71	9.42	3.97	3.39	3.60	196	257
Aug	3.00	1.14	0.52	44.68	99.68	29.29	14.96	10.56	4.17	4.45	2.16	215	273
Sep	3.00	2.86	7.23	38.46	92.79	30.60	9.71	22.55	5.79	5.09	3.96	222	314
Total	33.60	46.27	123.49	958.68	887.57	276.71	171.06	175.82	64.18	58.12	22.32	2819	3559

a. From the Enlisted Strength planners' spreadsheet model.

Stayers in each month are calculated as the difference between the monthly intermediate EAS total and the monthly intermediate losses. In our example, monthly October EAS intermediate losses are:

932 - 468 = 464.

We repeat this process to calculate careerist EAS losses. Table 5 shows all calculated EAS losses for first-term, intermediate, and careerist Marines.

17. In an out-year, this term would be the corrected October EAS intermediate population.

18. As currently calculated, the same continuation rate is set for all months of the fiscal year. We originally considered calculating continuation rates that allowed for seasonal variation (the notion being that there are more EAS separations in the summer) but realized that, by applying rates to the EAS population by month and YOS, the model already captures that seasonality.

Table 5. EAS first-term, intermediate, and careerist losses

Month	First-Term	Intermediate	Careerist	EAS losses
Oct	1636	468	9	2113
Nov	923	223	10	1156
Dec	817	187	11	1015
Jan	1482	246	13	1741
Feb	515	242	13	770
Mar	741	269	13	1023
Apr	610	169	14	793
May	1048	173	14	1235
Jun	2197	209	13	2419
Jul	2444	196	14	2654
Aug	1987	215	13	2215
Sep	1865	222	12	2099
Total	16265	2819	149	19233

Phasing EAS losses by grade

These monthly EAS losses must be phased by grade. This is done by calculating a weighted average of the historical grade distribution of EAS losses. The model (as modified over the course of this study) allows planners to set a weighed average with up to 4 previous years' data, unequal weights, and unconsecutive years. Table 6 shows the 3-year weighted average that the planners used.[19]

For example, the E7 weight would be:

$= (.0020 + .0025 + .0019)/3 = .0021$.

This weight (which differs by paygrade) then is applied to total EAS losses by month (as reported in table 5). Table 7 reports results. For example, the E6 cell in column B of table 7 is equal to:

(.0346) * total EAS losses in Oct = (.0346) * (2113) = 73.17, or 73.

19. The planners currently set weights based on their best judgment—in this example, each of the last 3 years is given a weight of 33 percent. Appendix G describes information and methods that planners can use to better determine appropriate weights.

Table 6. Computation of grade weight for EAS losses

Paygrade	FY01	FY01 share	FY02	FY02 share	FY03	FY03 share	grade weight
E9	0	0.0000	1	0.0001	1	0.0001	0.0001
E8	2	0.0001	0	0.0000	6	0.0003	0.0001
E7	36	0.0020	45	0.0025	34	0.0019	0.0021
E6	632	0.0346	671	0.0372	583	0.0321	0.0346
E5	6108	0.3344	5824	0.3227	6010	0.3310	0.3294
E4	8584	0.4700	8674	0.4806	8789	0.4841	0.4782
E3	2394	0.1311	2373	0.1315	2282	0.1257	0.1294
E2	364	0.0199	334	0.0185	344	0.0189	0.0191
E1	143	0.0078	127	0.0070	107	0.0059	0.0069
Total	18263	1	18049	1	18156	1	1

Table 7. Paygrade phasing of monthly total EAS losses[a, b]

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Paygrade	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Rates
E9	0	0	0	0	0	0	0	0	0	0	0	0	0.0000
E8	0	0	0	0	0	0	0	0	0	0	0	0	0.0002
E7	4	2	2	4	2	2	2	3	5	6	5	4	0.0021
E6	73	40	35	60	27	35	27	43	84	92	77	73	0.0346
E5	762	381	334	573	254	337	261	407	797	874	730	691	0.3294
E4	1106	553	485	833	368	489	379	591	1157	1269	1059	1004	0.4782
E3	299	150	131	225	100	132	103	160	313	343	287	272	0.1294
E2	44	22	19	33	15	20	15	24	46	51	42	40	0.0191
E1	16	8	7	12	5	7	5	9	17	18	15	15	0.0069
Total EAS seps	2304	1156	1013	1740	771	1022	792	1237	2419	2653	2215	2099	0.9999

a. From the Enlisted Strength planners' spreadsheet model.
b. Rounding errors account for the slight difference between total losses distributed by month and those originally distributed just by paygrade.

For those in paygrades E1 through E5, the number of EAS carryovers (200 in this example year) is added to the October EAS loss total before applying the respective grade weight.[20]

Calculating EAS continuation rates

In January 2004, the enlisted strength planner requested MPP-50's assistance in calculating intermediate and careerist EAS continuation rates. The planner made this request because historically reported continuation rates were unreliable (they did not seem to reflect continuation behavior observed over the fiscal year), and there was no documented methodology to show how the rates were computed.

The first step was to identify the population of interest, defined as those in the active-duty career force—i.e., enlisted Marines with YOS 4 to 20.[21] Annual snapshots for 30 September (the last day of the fiscal year) were pulled from the TFDW to construct a dataset for FY89 to FY03.

To determine the YOS at time of EAS, the planner calculates the number of years between the Armed Forces Active Duty Base Date and the TFDW date.[22] To ensure that the YOS refers to that at the

20. This number comes from the EAS cluster report. EAS carryovers are Marines who should have reenlisted or separated in the previous FY (because they had an EAS in that FY), but are still present—meaning they must have extended, etc. The EAS carryover amount is only added in October of the execution year and is not forecast in the out-years.

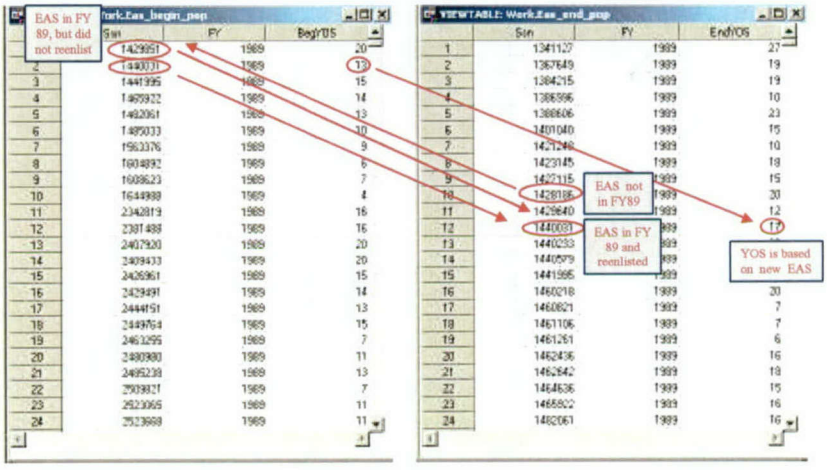
21. Marines also had to be in their second or later enlistment as determined by their Source of Entry code. However, because Source of Entry codes for some Marines may not get changed when they enter the career force, Marines with a code of "A," "1," or "7F" who *also* had 6 or fewer years of service were assumed to be first-termers and were excluded from the population of interest. As previously noted, first-term continuation rates are not calculated because the first-term force is carefully controlled through the FTAP.

22. We want completed years of service. The Impromptu request previously used years between the two dates to get YOS; this calculation did not always return completed years of service. At our suggestion, it was rewritten to get days between the two dates. These days were converted into years by dividing by 365. The integer from this division is completed years of service.

time of reenlistment, the YOS used for purposes of calculating the continuation rate is the YOS at the beginning of the fiscal year plus 1.

To determine if a particular Marine reenlisted at EAS, the planner first pulls the beginning-year EAS population by YOS and the total end-year population. For the FY of interest, he then compares the two files (see figure 5). Those who appear in both files (SSN#1440031 in our example) are tagged as continuers for that FY. The continuation rate then is calculated as those within a particular YOS who continued (i.e., they appear in both datasets) divided by those with an EAS in that year at the beginning of the FY (see figure 6).

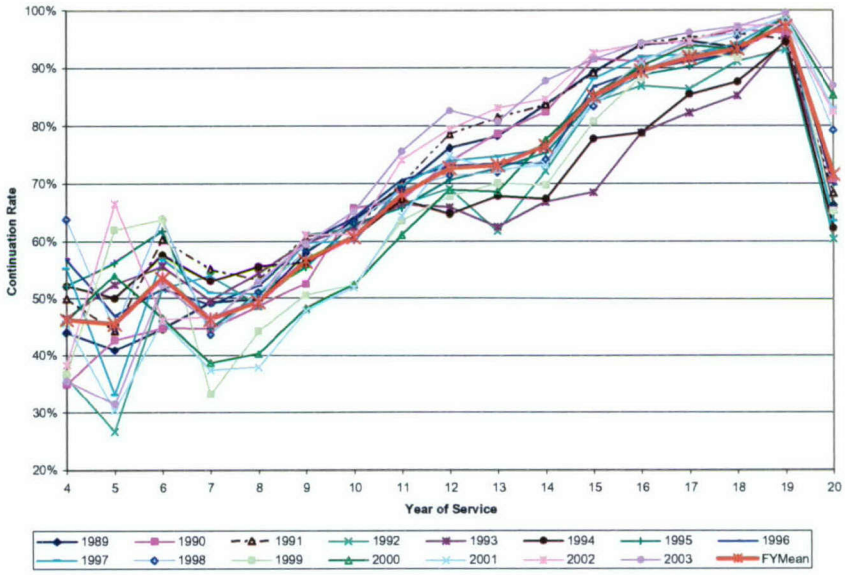
Figure 5. Determining the EAS continuation population[a]



a. Briefing from MPP-50.

Continuation rates then are exported to Excel so that the mean and standard deviations can be reported, confidence intervals can be computed, and means can be weighted to make the forecast.

Figure 6. Historical EAS continuation rates by YOS, FY89 to FY03[a]



a. Briefing from MPP-50.

A note on the strength planner's EAS continuation rates

In reviewing this process, we realized that those with an EAS in the FY we are examining are counted as "continuing" if they are still present at the end of that fiscal year.[23] As such, this process overlooks career-force Marines who reenlisted in the FY before their EAS FY (current regulations allow career-force Marines to reenlist up to a full year before their EAS). Thus, the strength planner's continuation rates understate the true career-force EAS continuation rate.

For example, assume that two Marines, A and B, have EAS dates in FY02 and are in YOS 8. If Marine A reenlists in his EAS FY, he will be in both the numerator and the denominator of the continuation rate calculation (he is, in fact, the type of reenlister currently counted). If Marine B reenlists early and does so in FY01, he will have a new EAS (one in FY06) in FY02 and will not be part of the numerator or the denominator of the continuation rate equation—even though he should appear in both for a true career-force EAS continuation rate.

23. We implicitly assume that those who leave in their EAS year are, in fact, EAS separations and not attrites.

Is this a problem? Yes and no. It would be if the strength planner's career-force EAS continuation rates were used for *any other* purpose than strength planning. It is not a problem in the context of strength planning since the strength planners only care about EAS *separations.*

Removing pre-EAS attrition in the out-years

EAS snapshots are taken at the beginning (or before the beginning) of the execution year. Some Marines, however, will attrite before their EAS. Thus, it is necessary to remove this pre-EAS attrition in the out-years that follow the execution year.[24]

As an example, we focus on the first-term EAS population.[25] The strength planners first examine historical data on the size of the first-term EAS population by EAS date (see table 8).

For example, table 8 shows that at the end of FY99 there were 21,707 first-termers who had an EAS in FY00. By the end of FY00, the number of first-termers with an EAS in FY00 was 354—meaning the size of the population had fallen by 98.4 percent.[26] Looking one year before the EAS year, we see that in FY98 there had been 23,483 Marines with an EAS of FY00. This population was 21,707 by FY99—meaning the size of the population had fallen by 7.6 percent.

Changes reflect a net loss, but each cell may not necessarily contain the same Marines who were in the previous group. Rather, they reflect the outcome of gains, losses, and changes in EAS dates over the period.[27]

---

24. Pre-EAS attrition is ignored in the execution year because the EAS continuation rates reflect only those who stayed (netting out both EAS and pre-EAS separations).

25. We use the same methodology to remove pre-EAS attrition from the intermediate and careerist EAS populations but analyze these groups separately since their behaviors (and resulting loss profiles) are different.

26. These individuals either attrited before EAS or left at EAS.

27. Strength planner calculations are designed to identify losses. Even though the strength planners use such terms as "pre-EAS losses" and "EAS continuation rates," considerable caution should be used before using these estimates for any other purposes. Here, for example, "pre-EAS losses" are an amalgamation of gains and losses.

Table 8. The first-term EAS population[a]

		EAS Year								
		1995	1996	1997	1998	1999	2000	2001	2002	2003
Fiscal Year	1994	20,323	22,887	27,284	28,787	4,104	826	0	0	0
	1995	471	21,445	24,997	27,011	29,475	2,597	538	0	2
	1996	35	460	23,084	24,914	27,311	27,453	3,663	406	0
	1997	15	25	647	22,981	24,843	25,310	28,874	4,928	19
	1998	8	11	28	638	23,330	23,483	26,231	28,163	5,328
	1999	4	8	13	30	395	21,707	24,384	26,278	28,832
	2000	2	5	7	10	15	354	22,489	24,822	26,732
	2001	1	0	0	2	2	9	234	22,969	25,353
	2002	1	0	0	3	2	6	7	327	23,857
	2003	1	0	0	1	0	1	3	15	445

a. From the Enlisted Strength Planners' spreadsheet model.

Taking year-to-year changes for dates from 1 to 3 years before the EAS year, we set factors that we can use to adjust the EAS population to what we predict it will be in the execution year. Table 9 shows these factors for the first-term EAS population. The last column is the 4-year average of adjustment factors for FY00-FY03 that the planners apply to create the out-year plans.

Table 9. First-term EAS population correction factors[a]

	1995	1996	1997	1998	1999	2000	2001	2002	2003	4 Yr Avg
Eas Yr-3	92.39%	92.38%	92.67%	93.83%	92.66%	92.19%	90.85%	93.31%	92.72%	92.27%
Eas Yr-2	91.64%	90.88%	91.62%	92.24%	90.96%	92.78%	92.96%	94.46%	94.84%	93.76%
Eas Yr-1	90.83%	93.70%	92.35%	92.24%	93.91%	92.44%	92.23%	92.53%	94.10%	92.82%
Eas Yr	2.32%	2.15%	2.80%	2.78%	1.69%	1.63%	1.04%	1.42%	1.87%	1.49%

a. From the Enlisted Strength Planners' spreadsheet model.

Now, assume that the planners are developing a plan for 1 year into the future. In this case, they would apply the EAS Yr1 rates to the first-term EAS population. For example, there were 1,892 first-termers with an EAS in October (from figure 4). Applying the EAS Yr1 rate for first-termers to this number yields (1,892)*(.9282) = 1,756, which is the first cell in the first column of table 10.[28]

28. As previously noted, pre-EAS attrition also is removed from the intermediate and careerist EAS populations.

Table 10. EAS populations after removing 1 year of pre-EAS attrition

MONTH	First Term	Intermed	Career	Total
OCT	1756	640	73	2469
NOV	1197	343	86	1626
DEC	1058	295	98	1451
JAN	1823	387	114	2324
FEB	988	370	121	1479
MAR	1062	411	123	1596
APR	889	284	118	1291
MAY	1369	294	130	1793
JUN	2748	342	118	3208
JUL	3010	311	113	3434
AUG	2518	335	99	2952
SEP	2326	368	98	2792
Total	20744	4380	1291	26415
Pop bef Disc	22348	6378	2258	
Delta	-1604	-1998	-967	
Net pop	20744	4380	1291	
Rate Applied	92.82%	68.67%	57.17%	

If the planners want to develop another plan for 2 years into the future, they will start with the 1-year corrected EAS population and correct it again by the EAS Yr2 factors (see table 11). The October first-term value of 1,756 (calculated above) would be multiplied by .9376 to yield 1,646 (the first cell in the first column of table 11).

Table 11. EAS populations after removing 2 years of pre-EAS attrition

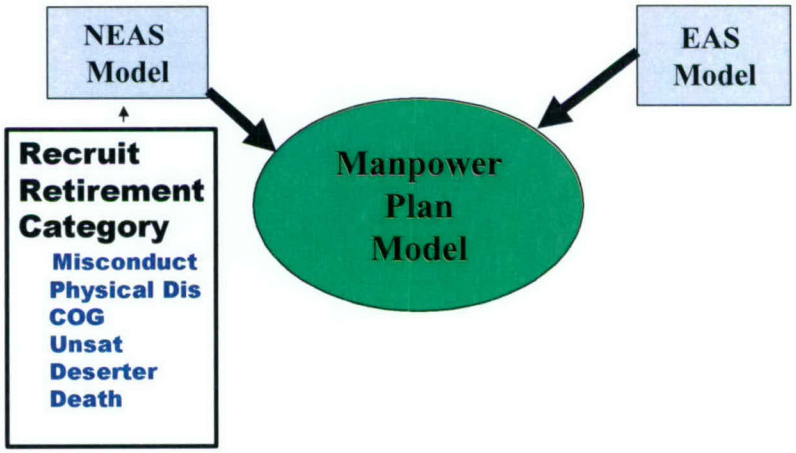
MONTH	First Term	Intermed	Career	Total
OCT	1646	608	77	2331
NOV	1122	326	91	1539
DEC	992	280	104	1376
JAN	1709	368	121	2198
FEB	926	352	128	1406
MAR	996	391	130	1517
APR	834	270	125	1229
MAY	1284	279	138	1701
JUN	2577	325	125	3027
JUL	2822	296	120	3238
AUG	2361	318	105	2784
SEP	2181	350	104	2635
Total	19450	4163	1368	24981
Pop bef Dis	20744	4380	1291	
Delta	-1294	-217	77	
Net pop	19450	4163	1368	
Rate Applied	93.76%	95.05%	105.96%	

The number of stayers and leavers then is determined based on these corrected EAS populations (EAS Yr1 corrected populations for 1 year after the execution year, EAS Yr2 corrected populations for 2 years after the execution year, etc.) Grade shaping of forecast EAS losses is done in the same way as in the execution year.

NEAS Loss Model

NEAS losses have three loss components: recruit losses (defined as losses from either bootcamp—MCRD Parris Island or MCRD San Diego), retirements (defined as such by separation code), and category (or attrition) losses (sorted into categories by separation code) (see figure 7). About 46 percent of all losses are NEAS, with category losses accounting for about 28 percent, recruit losses for about 12 percent, and retirements for about 6 percent of all losses.

Figure 7. Marine Corps endstrength models: Adding the NEAS Model[a,b]



a. Briefing from the Enlisted Strength planners.
b. Under category losses, COG stands for convenience of the government losses.

Recruit loss model and procedures

Recruit losses are those that occur from the MCRDs (using monitored command codes (MCCs) and reported unit codes (RUCs) of the loss to identify recruits).[29] Because male and female recruits' loss behavior is so different, all calculations in this module are done separately by gender.

Recruit accession phasing

Before estimating recruit losses, we must account for recruit accession phasing. MCRC's current trimester phasing rates for male recruits are 48 percent for June, July, August, and September (JJAS), 31 percent for October, November, December, and January (ONDF), and 21 percent for February, March, April, and May (FMAM).[30] Table 12 shows historical monthly accession phasing rates for FY03.

Table 12. Male and female recruit phasing rates for FY03

FY03 Month	Phasing	Male Phasing	Male Phasing Rate	Female Phasing	Female Phasing Rate
Oct	3260	3064	0.0974	196	0.0849
Nov	3078	2864	0.0911	214	0.0927
Dec	1717	1607	0.0511	110	0.0476
Jan	2399	2228	0.0709	171	0.0741
Feb	1744	1557	0.0495	187	0.0810
Mar	2139	1932	0.0614	207	0.0896
Apr	1583	1486	0.0473	97	0.0420
May	1486	1402	0.0446	84	0.0364
Jun	4324	4113	0.1308	211	0.0914
Jul	3479	3239	0.1030	240	0.1039
Aug	4144	3846	0.1223	298	0.1291
Sep	4401	4107	0.1306	294	0.1273
Total	33754	31445	1	2309	1

29. MCCs for recruits at the two recruit training depots are 016 and 017. RUCs used to identify recruits at the depots are 34022 (for MCC 017) and 32092/32172 (for MCC 016).

30. This recruit phasing is set in Memo 01, which MP sends to MCRC (described in an earlier section).

For example, this table shows that:

FY03 JJAS phasing rate = .1308 + .1030 + .1223 + .1306 = 48.67%.

To forecast recruit phasing rates for the execution year, the planners compute a 4-year weighted average of historical monthly phasing rates (by month and gender). Table 13 shows the historical male phasing rates that are weighted to create the FY04 predicted phasing rates.[31]

Table 13. Monthly male phasing rates for FY00 to FY03 and forecasted FY04 male phasing rates

Month	FY00	FY01	FY02	FY03	FY04-pred
Oct	0.0855	0.0819	0.0819	0.0974	0.0897
Nov	0.0487	0.0785	0.0785	0.0911	0.0848
Dec	0.0557	0.0929	0.0929	0.0511	0.0720
Jan	0.0988	0.0655	0.0655	0.0709	0.0682
Feb	0.0587	0.0689	0.0689	0.0495	0.0592
Mar	0.0512	0.0612	0.0612	0.0614	0.0613
Apr	0.0477	0.0518	0.0518	0.0473	0.0496
May	0.047	0.0429	0.0429	0.0446	0.0438
Jun	0.1429	0.1139	0.1139	0.1308	0.1224
Jul	0.1349	0.1374	0.1374	0.103	0.1202
Aug	0.1128	0.1281	0.1281	0.1223	0.1252
Sep	0.1161	0.0769	0.0769	0.1306	0.1038
Total	1	1	1	1	1

At this point, the planners can phase recruit accessions in the execution year (in this example, FY04). They start with the number of female accessions (2,282) set in Memo 01. For male accessions, they enter a proxy number (30,009 in this example).[32] At the end of the entire endstrength process, the strength planners run the models and the true number of male accessions required will be generated and phased accordingly. In the meantime, this proxy number serves as a placeholder.

31. In this example, weights used are .5 for FY03, .2 for FY02, .3 for FY01, and zero for FY00.

32. This is a number used to start the process, and is essentially a guess for the number that will be ultimately determined by the process.

From the male and female accession numbers, the planners subtract the estimated number of male and female prior-service enlisted personnel (PSEPs).[33] To calculate this, they examine the historical pattern of recruit phasing by month and grade (table 14 shows these figures for males in FY03).

Table 14. Male recruit phasing by month and grade, FY03

paygrade/month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
E9	0	0	0	0	0	1	0	0	0	0	0	0	1
E8	0	0	0	0	0	1	0	0	0	0	0	0	1
E7	0	1	0	0	0	0	1	0	1	0	0	0	3
E6	1	0	0	5	0	1	1	3	1	6	2	2	22
E5	1	1	0	2	31	28	21	2	5	7	0	3	101
E4	0	0	2	3	19	40	31	7	1	5	2	3	113
E3	0	2	2	1	12	9	7	3	1	3	0	0	40
E2	575	531	311	508	350	407	291	350	1284	842	899	817	7165
E1	2487	2329	1292	1709	1145	1445	1134	1037	2820	2376	2943	3282	23999
Total	3064	2864	1607	2228	1557	1932	1486	1402	4113	3239	3846	4107	31445

The planners assume that any recruits in paygrades E3 to E9 are PSEPs. In table 14, this number would be equal to:

Total - E1 - E2 = 31,445 - 23,999 - 7,165 = 281.

The planners use a 4-year weighted average of historical accession data for those in paygrades E3 to E9 to estimate the number of PSEPs in FY04.[34]

Subtracting out PSEPs from male and female accessions yields:

Net female accessions = 2,282 - 28 = 2,254

Net male accessions = 30,009 - 457 = 29,552.

---

33. PSEPs are subtracted since they do not go through recruit training.

34. The weights used in this example are .5 for FY03, .3 for FY02, .2 for FY01, and zero for FY00. If MCRC significantly changed the number of PSEP accessions, conversations between the strength planners and MCRC would result in an adjustment of these numbers.

The planners now phase these male and female net accession numbers over the execution FY. To do so, they multiply the net accession number by the monthly accession phasing rate estimated for the FY. In our FY04 example, the number of male accessions in December would be:

29,552 * .072 = 2,128 (see table 15).

Table 15. Recruit accession phasing for FY04

Females			oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	total
Total	2282	phase rate	0.071	0.069	0.076	0.075	0.075	0.106	0.056	0.035	0.108	0.094	0.136	0.1	1
PSEPs	28	phased #	160	155	170	170	169	239	127	78	243	212	306	226	2255
net	2254														
Males			oct	nov	dec	jan	feb	mar	apr	may	jun	jul	aug	sep	total
Total	30009	phase rate	0.09	0.085	0.072	0.068	0.059	0.061	0.05	0.044	0.122	0.12	0.125	0.104	1
PSEPs	457	phased #	2648	2506	2128	2015	1749	1812	1463	1294	3617	3552	3700	3067	29551
net	29552														

Recruit loss phasing

In addition to forecasting rates to phase accessions over the execution year, the strength planners also must forecast recruit loss rates (by gender and month) to phase losses over the execution year. To do so, the planners first calculate historical recruit loss rates for the previous 4 years.[35] Table 16 shows this calculation for FY03. For example, the male loss rate in October is:

October male losses/October male phasing = 345/3,064 = .1126.

Once recruit loss rates are calculated, the planners average the rates—weighting the years—to estimate loss rates for the next FY (FY04 in table 17).[36]

Now, the planners apply predicted loss rates from table 17 to phased accessions in the execution year (see table 18). For example, the projected number of male recruit losses in October of FY04 is:

.1188 * 2648 = 315.

35. Historical recruit loss numbers come from the gains/losses cube.

36. The weights used in this figure are .6 for FY03, .2 for FY02, .2 for FY01, and zero for FY00.

Table 16. Calculating recruit loss rates FY03

Month	Phasing	Male Phasing	Female Phasing	Attrition	Male Losses	Male Loss Rate	Female Losses	Female Loss Rate
Oct	3260	3064	196	375	345	0.1126	30	0.1531
Nov	3078	2864	214	285	253	0.0883	32	0.1495
Dec	1717	1607	110	269	253	0.1574	16	0.1455
Jan	2399	2228	171	377	326	0.1463	51	0.2982
Feb	1744	1557	187	347	308	0.1978	39	0.2086
Mar	2139	1932	207	322	278	0.1439	44	0.2126
Apr	1583	1486	97	291	251	0.1689	40	0.4124
May	1486	1402	84	181	157	0.1120	24	0.2857
Jun	4324	4113	211	281	229	0.0557	52	0.2464
Jul	3479	3239	240	300	268	0.0827	32	0.1333
Aug	4144	3846	298	342	287	0.0746	55	0.1846
Sep	4401	4107	294	330	288	0.0701	42	0.1429
Total	33754	31445	2309	3700	3243		457	

Table 17. Recruit loss model: last four years' recruit loss rates and projected loss rates for FY04[a]

	FY2003		FY2002		FY2001		FY2000		FY04 ATTR RATE	
DATE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
10-Oct	0.1126	0.1531	0.1304	0.2750	0.1260	0.2500	0.1274	0.2542	0.1188	0.1969
11-Nov	0.0883	0.1495	0.1228	0.4894	0.1347	0.3830	0.1797	0.1163	0.1045	0.2642
12-Dec	0.1574	0.1455	0.1243	0.0917	0.0996	0.2248	0.2528	0.3796	0.1392	0.1506
1-Jan	0.1463	0.2982	0.1707	0.3025	0.1098	0.1481	0.0898	0.0711	0.1439	0.2690
2-Feb	0.1978	0.2086	0.1337	0.2192	0.1400	0.3699	0.1562	0.1290	0.1734	0.2430
3-Mar	0.1439	0.2126	0.1804	0.2008	0.1418	0.1004	0.1861	0.1744	0.1508	0.1878
4-Apr	0.1689	0.4124	0.1946	0.3154	0.1419	0.3154	0.1179	0.2059	0.1686	0.3736
5-May	0.1120	0.2857	0.1782	0.4348	0.1565	0.4348	0.1852	0.2353	0.1341	0.3453
6-Jun	0.0557	0.2464	0.0505	0.0878	0.0601	0.1527	0.0649	0.1500	0.0555	0.1959
7-Jul	0.0827	0.1333	0.0883	0.2938	0.0569	0.1130	0.0786	0.1254	0.0787	0.1613
8-Aug	0.0746	0.1846	0.1002	0.1633	0.1062	0.1900	0.1087	0.2209	0.0860	0.1814
9-Sep	0.0701	0.1429	0.1323	0.2143	0.1677	0.2013	0.1064	0.1058	0.1021	0.1689
									12.13%	**22.82%**

a. From the Enlisted Strength Planners' spreadsheet model.

Table 18. Projecting FY04 recruit losses[a]

	FY04 ATTR. RATE		Phased	Phased	Male Attrition	Female Attrition	
Month	MALE	FEMALE	Male Number	Female Number	Distribution	Distribution	Total
Oct	0.1188	0.1969	2648	160	315	32	**347**
Nov	0.1045	0.2642	2506	155	262	41	**303**
Dec	0.1392	0.1506	2128	170	296	26	**322**
Jan	0.1439	0.2690	2015	170	290	46	**336**
Feb	0.1734	0.2430	1749	169	303	41	**344**
Mar	0.1508	0.1878	1812	239	273	45	**318**
Apr	0.1686	0.3736	1463	127	247	47	**294**
May	0.1341	0.3453	1294	78	174	27	**201**
Jun	0.0555	0.1959	3617	243	201	48	**249**
Jul	0.0787	0.1613	3552	212	280	34	**314**
Aug	0.0860	0.1814	3700	306	318	56	**374**
Sep	0.1021	0.1689	3067	226	313	38	**351**
Total	**12.13%**	**22.82%**	3272	481	3272	481	**3753**

a. From the Enlisted Strength Planners' spreadsheet model.

Possible improvements to the recruit loss model

We explored the possibility of changing several aspects of the recruit loss model to improve its accuracy.

First, the current method assumes that recruits attrite within the same month they ship. Obviously, this is a simplification since most recruits attrite a month or two after their accession month. One simple way to account for this lagged recruit attrition might be to assume that a certain portion of the attrition happens in the accession month, and the remaining portion happens in a later month or months. For example, if we assume that 33 percent of attrition happens in the attrition month and 66 percent happens in the following month, then—using the numbers in table 18—male attrition in November 2004 would be:

66% of Oct attrition + 33% of Nov attrition = (.66)(2648)(.1188) + (.33)(2506)(.1045) = 294.

If this lag is not taken into account, an unusually large accession cohort at the end of one FY, for example, could mean that estimated losses in the first month of the next FY are too low.

The current method is based on the historical pattern of recruit losses. If accession phasing changes in the future, this loss pattern also

may change. Thus, this module should be reexamined if the Marine Corps changes the pattern of accession phasing.

Finally, we have developed several different methods that can be used to weight the data—including a significant events database, an optimization tool, and guidance on the use of exponential smoothing (see appendix G). These methods will allow planners to better set loss weights. Weightings also should be reexamined annually.

Retirement loss model and procedures

To forecast actual retirements for the end of a fiscal year (in this case, FY04), the planners extract from the September personnel files the number of planned retirements submitted as of the end of the previous FY.[37] From these numbers, they filter out those that are physical disability retirements (because they will be counted elsewhere as category losses). The number they obtain—1,605 in this example—is the number of retirements they would expect if:

- All those who said they would retire at the beginning of the FY actually did retire within the FY, AND[38]
- There were **no** additional Marines who filed for retirement later in the fiscal year but still retired within the fiscal year.

Although the first of these is likely to be more or less correct, the second is decidedly not. So it is not surprising that the number of planned retirements has understated the actual number of retirements in each FY (see table 19).

For example, at the end of FY88, 1,088 enlisted Marines indicated that they would retire in FY89 (first row of column B). At the end of FY89, however, 1,499 had actually retired (first row of column D)—or

37. All Marines are required to submit retirement papers 4 to 14 months before retirement.

38. Those who filed retirement papers at the beginning of the FY would retire within the FY unless they (a) filed more than 12 months before they intended to retire, or (b) changed their minds about (or the dates of) their planned retirement.

137.78 percent of the original number indicating retirement plans.[39] Over the FY00–03 period, the average magnitude of this overstatement was about 30 percent. Thus, to project actual retirements for FY04, the number of planned retirements at the end of FY03 (1,605) is increased by 30 percent—resulting in 2,079 projected retirements.

Table 19. Projecting actual enlisted retirements based on planned retirements[a]

A	B	C	D	E
Date	Planned Filtered Retirements	Date	Actual Retirement	Percent Retired
9/30/1988	1088	9/30/1989	1499	137.78%
9/30/1989	1018	9/30/1990	1488	146.17%
9/30/1990	1212	9/30/1991	1611	132.92%
9/30/1991	1244	9/30/1992	1942	156.11%
9/30/1992	1346	9/30/1993	1756	130.46%
9/30/1993	1521	9/30/1994	1991	130.90%
9/30/1994	1632	9/30/1995	2024	124.02%
9/30/1995	1547	9/30/1996	2002	129.41%
9/30/1996	1740	9/30/1997	2271	130.52%
9/30/1997	1731	9/30/1998	2278	131.60%
9/30/1998	1673	9/30/1999	2355	140.77%
9/30/1999	1596	9/30/2000	2107	132.02%
9/30/2000	1665	9/30/2001	2194	131.77%
9/30/2001	1497	9/30/2002	1993	133.13%
9/30/2002	1532	9/30/2003	1857	121.21%
9/30/2003	1605	9/30/2004		
FY00-03 Avg				129.53%
Projection 04			2078.957	

a. From the Enlisted Strength Planners' spreadsheet model.

Now the planners distribute FY04 retirements over the months. To do so, they calculate average monthly retirements using the monthly distribution of actual retirements over the past four FYs (see table 20).

39. Unfortunately, we cannot routinely match those who planned to retire with those who actually did retire since planned retirements come from the Total Force Data Warehouse (which does have SSN information) and actual retirements come from the gains/losses cube (which does not have SSN information).

Table 20. Distributing projected retirements across months[a]

Month	2000	2001	2002	2003	4-year average		Phased Projection
Oct	242	244	226	219	233	11.4%	237
Nov	158	172	149	181	165	8.1%	168
Dec	63	142	134	141	120	5.9%	123
Jan	103	122	84	106	104	5.1%	106
Feb	226	205	222	181	209	10.2%	212
Mar	126	122	121	148	129	6.3%	131
Apr	140	139	123	146	137	6.7%	139
May	149	118	99	92	115	5.6%	116
Jun	136	142	119	122	130	6.4%	133
Jul	212	220	213	134	195	9.6%	200
Aug	299	285	242	175	250	12.3%	256
Sep	253	283	262	212	253	12.4%	258
FY Total	2107	2194	1994	1857	2040	1	2079

a. From the Enlisted Strength Planners' spreadsheet model.

Then, they determine what share each is of the total (for example, the October average of 233 is 11.4 percent of the total average of 2,040) and apply these rates to projected FY04 retirements (2,079) to get the monthly distribution. There is no attempt to grade shape retirement projections; grade-shaping is done only after all NEAS losses are totaled.[40]

Using an alternative method to model the retirement decision

Even if the current method of modeling retirements produces reliable predictions, it is worthwhile to "check" retirement projections using alternative methods. We explored modeling retirement based on those who are retirement-eligible. Variables in the models included the numbers of Marines who have submitted retirement papers, years of service, paygrade, years in grade, EAS year, and retirement plan. Unfortunately, these efforts did not yield useful projection tools.

The alternative method we developed to forecast retirements uses planned retirements and the overall unemployment rate.[41] When the

40. As previously noted, this is because accuracy by month is more important than accuracy by grade.

41. The planner already uses planned retirements. The current overall unemployment rate can be found on the Bureau of Labor Statistics' website at http://www.bls.gov.

unemployment rate is high and it is difficult to find a job in the civilian economy, Marines are less likely to retire. In contrast, when the unemployment rate is low and it is easy to find civilian employment, Marines are more likely to retire.

We used data on planned retirements and the civilian unemployment rate to predict actual retirements between FY89 and FY03. We omitted information from FY92, when actual retirements greatly exceeded planned retirements because of the drawdown. We estimated the equation using ordinary least squares and found that:

$$\text{Retirements} = 674 + 1.05 \times \text{Planned retirements} - 57.23 \times \text{Unemployment rate}$$

All estimated coefficients, including the constant, are significant at the 1-percent level, and the adjusted R-squared for the equation is .94 (suggesting that the equation explains 94 percent of the variation in actual retirements). Table 21 shows the data, as well as the forecasts and errors from the current method and our proposed alternative.

To use this formula, the planners would simply insert the number of planned retirements and the current unemployment rate into the formula. They then would distribute retirements by month as before.

Forecasting retirements in the out-years

The current procedure for forecasting retirements for the out-years simply uses the current year's forecast. We propose that the planners use the formula reported above to forecast out-year retirements. To do so, the planners would use the number of planned retirements in the current year and an estimate of the unemployment rate for the next year. Unemployment rate estimates can be found in financial publications.[42]

42. See, for example, www.conference-board.org/economics/stalk.cfm.

Table 21. Comparing retirement projections: Current method and proposed alternative method

	Data (actuals)			Projected retirements			
	Retirements		Unemployment rate	Current method		Alternative method	
FY	Planned	Actual		Forecast	Error[a]	Forecast	Error[b]
1989	1,088	1,499	4.5	1,414	85	1,558	-59
1990	1,018	1,488	5.0	1,323	165	1,456	32
1991	1,212	1,611	6.4	1,576	35	1,579	32
1992[c]							
1993	1,346	1,756	6.4	1,750	6	1,720	36
1994	1,521	1,991	5.4	1,977	14	1,961	30
1995	1,632	2,024	4.8	2,122	-98	2,111	-87
1996	1,547	2,002	4.6	2,011	-9	2,034	-32
1997	1,740	2,271	4.2	2,262	9	2,259	12
1998	1,731	2,278	3.7	2,250	28	2,278	0
1999	1,673	2,355	3.5	2,175	180	2,229	126
2000	1,596	2,107	3.3	2,075	32	2,159	-52
2001	1,665	2,194	4.2	2,165	30	2,180	14
2002	1,497	1,993	5.3	1,946	47	1,941	52
2003	1,532	1,857	5.6	1,992	-135	1,961	-104

a. This is the difference between actual retirements and those forecast by this method.
b. This is the difference between actual retirements and those forecast by this method.
c. Data for 1992 are omitted because of the drawdown.

Category (or attrition) losses

Category (or attrition) losses are all losses that occur after bootcamp but are not counted as EAS or retirement losses (figure 8 lists the categories). Although the enlisted strength planners track categories historically, they do not forecast them separately.[43] Because attrition reasons tend to be "soft," we believe this is the right approach.

43. They do forecast deaths separately, but only to report the number of death payments required.

Figure 8. Category (or attrition) losses and their relative importance[a]

- **Convenience of the Government (20%)**
  - Conscientious Objector
  - Sole survivor
  - Hardship
- **Physical Disability (18%)**
  - Permanent disability
  - Temporary disability
- **Misconduct (43%)**
  - Drugs
  - Minor disciplinary infractions
  - Pattern of misconduct
- **Unsatisfactory Performance (3%)**
  - Weight control
  - Unsatisfactory performance
  - Unsanitary habits
  - Unsuitability
- **Deserter Status (15%)**
  - Incidents of Desertion
- **Death (1%)**
  - Non Combat
  - Combat

a. Briefing from the Enlisted Strength Planners.

The enlisted strength planners use two methods to forecast category losses by month. The first, shown in table 22, uses a weighted average of the last 3 years' category losses.[44]

The second method the strength planners use to project category losses by month is Monte Carlo simulations (see table 23). The random variable column reports values from the last iteration of the Monte Carlo simulation; the mean column reports the mean value of all Monte Carlo iterations. The lowest and highest values are those for a particular month over a 4-year period, whereas the "most likely value" refers to a weighted average of the previous 4 years (weights can vary based on the planners' judgment).

The strength planners may decide to use the Monte Carlo estimates if they appear to be more plausible than those resulting from the weighted average. Usually though, they only use this method to forecast a particular loss category (for example, deaths) that seems to have a random component to its variation.

44. Typically, the strength planners use the same weights used for recruit losses—0.5 for the most recent year, then 0.3 and 0.2 for the previous 2 years. In table 25, however, the planners used 0.3 for the most recent year due to the attrition effects of the conflict in Iraq. This illustrates the flexibility of the process, which allows the strength planners to reweight based on their expertise and judgment.

Table 22. Category (or attrition) losses: Forecasting by weighted average of the last 3 years[a]

		1st	2nd	3rd		
		0.3	0.5	0.2		
	FY00	FY01	FY02	FY03	FY00-02	FY01-03
Oct	581	594	614	641	597	618
Nov	626	609	626	565	618	604
Dec	438	597	605	605	568	603
Jan	590	538	598	567	566	577
Feb	930	876	803	769	865	807
Mar	789	689	656	606	699	648
Apr	707	606	602	569	625	593
May	658	652	645	552	651	619
Jun	747	666	563	456	651	552
Jul	631	730	677	533	694	644
Aug	742	706	733	457	721	645
Sep	655	582	625	465	610	568
	8094	7845	7747	6785	7865	7478

a. From the Enlisted Strength Planners' spreadsheet model.

Table 23. Monte Carlo simulations for category (or attrition) losses[a]

	Random Variable	Lowest Value	Most Likely Value	Highest Value	Mean
OCT	603	575	619	634	609
NOV	577	564	591	625	593
DEC	581	435	602	604	547
JAN	577	561	565	594	574
FEB	560	545	574	697	606
MAR	661	600	631	781	671
APR	659	566	585	707	619
MAY	594	544	594	656	598
JUNE	541	456	529	743	576
JULY	592	514	595	709	606
AUG	564	455	587	734	592
SEPT	606	463	532	645	546
	7114	6278	7004	8129	7137

a. From the Enlisted Strength Planners' spreadsheet model.

An alternative way of forecasting category (or attrition) losses

Although NEAS category losses now are forecast as a historical average of *counts*, we believe that forecasting them as a historical average of *rates* might provide a good alternative method.

Using this method may become increasingly important as the Marine Corps increases endstrength over the next few years.[45] An average of historical counts is effective as long as endstrength remains relatively constant, but it is likely to yield loss estimates that are too low as endstrength increases. At a minimum, this alternative way of forecasting losses could be used to check the current method.

We first calculate category losses (by month) as a share of congressionally mandated endstrength for the past 3 years.[46] Table 24 shows this calculation for FY03 (when congressionally mandated endstrength was 175,000).

Table 24. Alternative method: Calculating historical category loss rates, FY03 example

Month	Category Losses	Percentage
Oct	663	0.38
Nov	585	0.33
Dec	609	0.35
Jan	575	0.33
Feb	563	0.32
Mar	605	0.35
Apr	573	0.33
May	554	0.32
Jun	467	0.27
Jul	523	0.30
Aug	475	0.27
Sep	465	0.27

Then, we average the monthly rates for 3 previous years (see table 25).[47] These loss rates are applied to the congressionally mandated

45. Endstrength is estimated to climb to 181,000 by 2008.

46. Theoretically, it would be better to divide by the NEAS population to calculate an NEAS continuation and separation rate. Unfortunately, this is complicated by deserters (described more fully later in this section).

47. This can be a straight average (as shown) or a weighted average, depending on the planners' judgment.

endstrength projection for the next fiscal year. If, for example, our endstrength projection is 175,000 for October of FY04, forecast category losses for October would be:

175,000 * .36% (from table 25) = 630.

Table 25. Alternative method: Calculating an average category loss rate

Month	FY01	FY02	FY03	Average
Oct	0.36	0.34	0.38	0.36
Nov	0.37	0.37	0.33	0.36
Dec	0.37	0.27	0.35	0.33
Jan	0.32	0.35	0.33	0.33
Feb	0.39	0.42	0.32	0.38
Mar	0.40	0.46	0.35	0.40
Apr	0.37	0.42	0.33	0.37
May	0.39	0.39	0.32	0.37
Jun	0.41	0.44	0.27	0.37
Jul	0.43	0.36	0.30	0.37
Aug	0.45	0.43	0.27	0.38
Sep	0.37	0.39	0.27	0.34

Grade-shaping NEAS losses

NEAS loss projections still need to be grade-shaped by adding all estimated NEAS losses (recruit, retirement, and category) together by month. The planners then distribute these total monthly counts by grade using an average of historical rates (see tables 26 and 27).

Table 28 shows part of the FY04 NEAS attrition projections (under the current methodology), by month and grade.

Table 26. Calculating historical NEAS loss rates by grade, FY03 example

Paygrade	NEAS losses	FY03 NEAS loss rate
E9	247	0.02
E8	539	0.04
E7	802	0.07
E6	429	0.04
E5	336	0.03
E4	513	0.04
E3	1692	0.14
E2	2742	0.23
E1	4877	0.40
Total	12177	1.00

Table 27. Calculating average NEAS loss rates

Paygrade	FY00	FY01	FY02	FY03	Average
E9	0.02	0.02	0.01	0.02	0.018
E8	0.04	0.04	0.04	0.04	0.040
E7	0.06	0.07	0.06	0.07	0.065
E6	0.04	0.03	0.03	0.04	0.035
E5	0.03	0.04	0.02	0.03	0.030
E4	0.04	0.04	0.03	0.04	0.038
E3	0.13	0.13	0.13	0.14	0.133
E2	0.2	0.21	0.22	0.23	0.215
E1	0.44	0.42	0.45	0.40	0.428
Total	1	1	1	1	

Table 28. NEAS attrition projections for FY04[a]

MEMO 01 FY04 — NEAS ATTRITION

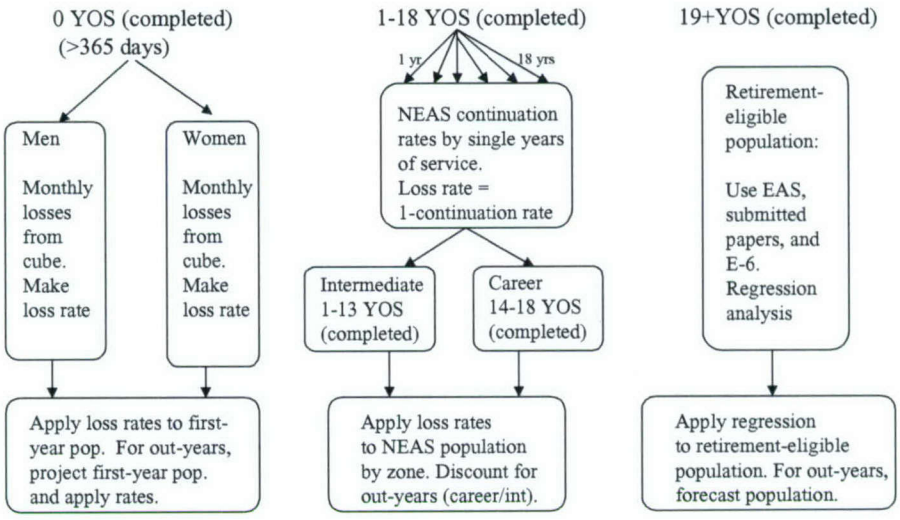
GRADE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
E-9	20	19	18	18	24	19	18	16	16
E-8	48	45	43	42	56	45	42	39	38
E-7	89	81	79	76	102	82	77	71	69
E-6	52	48	46	45	60	48	45	41	41
E-5	38	35	34	33	44	35	33	30	30
E-4	45	41	40	38	52	41	39	36	35
E-3	158	145	141	136	182	146	137	126	124
E-2	257	236	229	221	296	237	223	205	201
E-1	448	412	401	385	516	413	389	366	351
TOT	1155	1062	1031	994	1332	1066	1003	920	905

a. From the Enlisted Strength Planners' spreadsheet model.

Attempt at constructing an NEAS continuation rate

As part of our analysis, we tried to construct an NEAS continuation rate. Figure 9 lays out the strategy we developed.

Figure 9. Alternative strategy for forecasting NEAS losses

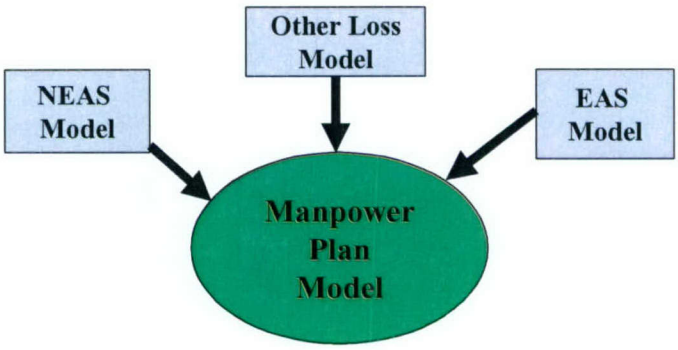


Unfortunately, we uncovered data issues (having to do with the presence of deserters) that made construction of such a rate too difficult. We document our strategy and its problems in appendix H, so that future researchers do not venture down the same path.

Other loss model

The tracking of loss-related data often can be imperfect. As such, there may be Marines who drop from the rolls but do not have a "loss" code associated with them. The strength planners must forecast these types of losses (see figure 10).

Figure 10. Marine Corps endstrength models: Adding the other loss model[a]



a. Briefing from the Enlisted Strength planners.

These losses due to inefficiencies in the tracking system are termed "implied" losses, and are assigned a loss code of RZ.[48] The strength planners currently use a four-year weighted average of historical "other loss" data to forecast these losses.[49]

Enlisted-to-Officer Model

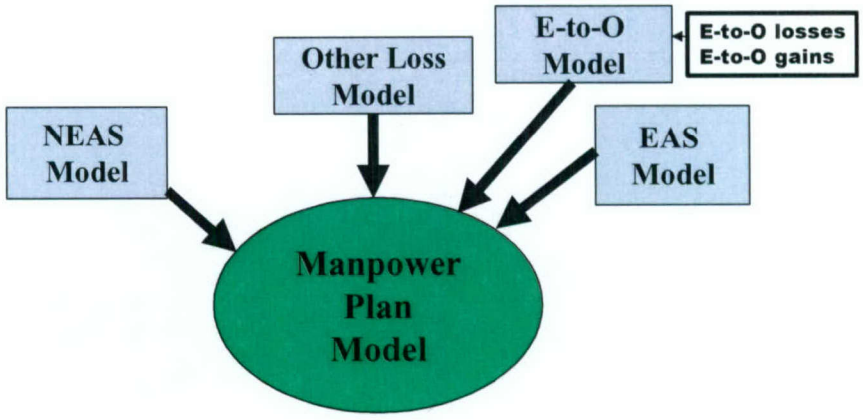
The Enlisted-to-Officer Model requires the endstrength planners to forecast both enlisted-to-officer losses and enlisted-to-officer gains (see figure 11).[50] The net amount (which is a net loss) is entered into the Manpower Plan Model.

48. The RZ loss code used to contain some retirements and other losses, but it seems to include implied losses only since FY00. A large share of these RZ (implied) losses are for Marines on appellate leave.

49. Weights used in this example are .45 for FY03, .25 for FY02, .15 for FY01, and .20 for FY00.

50. There are two reasons for this. First, even though the net effect on endstrength will be zero (1 enlisted loss + 1 officer gain), the enlisted planners need this estimate because officer and enlisted losses are forecast separately. Second, graduating former enlisted may go home after class completion (meaning they do not immediately post as officer gains).

Figure 11. Marine Corps endstrength models: Adding the E-to-O model[a,b]



a. Briefing from the Enlisted Strength planners.
b. E-to-O stands for Enlisted-to-Officer.

To forecast the number of enlisted-to-officer losses, the strength planners use a combination of actual and forecast data.

They first must account for enlisted endstrength losses, that is, enlisted Marines who no longer count as such because they become Warrant Officers (WOs) or Officers.

Each February, 230 to 250 enlisted Marines complete the Basic School and become WOs—they represent a loss to enlisted endstrength.[51]

The planners also must estimate gains and losses associated with prior enlisted and civilians becoming officers through the Officer Candidate Class (OCC) of Officer Candidate School (OCS).[52]

51. The OPS WO planner provides the endstrength planners with these numbers. There is virtually no WO class attrition, but if there were, it would not affect enlisted endstrength in the month it occurs (assuming these Marines did not attrite out of the Corps, in which case they would count as NEAS losses in the month they attrite) but would reduce the number of new WOs (who do count as enlisted losses).

52. OCC is one component of OCS; the other two components are the Platoon Leaders' Course (PLC) and the Naval Reserve Officers' Training Corps (NROTC). However, individuals in PLC and NROTC do not count against active-duty endstrength.

For each OCC, MCRC tells the planners its size and the class breakdown between enlisted Marines and civilians.[53] While enlisted Marines are in OCC, they remain in enlisted endstrength counts and are paid as enlisted. Even if they attrite from OCC (assuming they do not attrite out of the Corps, in which case they would count as NEAS losses in the month they attrite), they still count toward enlisted endstrength. Enlisted Marines in the OCC only count as enlisted endstrength losses after they are commissioned.

Civilians in OCC are a true "gain"—they count toward enlisted endstrength and are paid as E-5s while at OCC. The strength planners also must account for civilian class attrition, which counts as an enlisted endstrength loss in the month that it occurs. To estimate this attrition, the strength planners get an attrition rate estimate from OCS, which they apply to the first 2 months of the 3-month OCC program.[54]

The net difference between enlisted-to-officer losses and enlisted-to-officer gains is always negative, so the planners enter it as a loss.

Gains model

Almost all gains are from non-prior-service accessions. Continuous (less than a 90-day gap) and broken-service (more than a 90-day gap) reenlistments, recruiters on extended active duty (EAD), and returned deserters also represent gains (see figure 12).

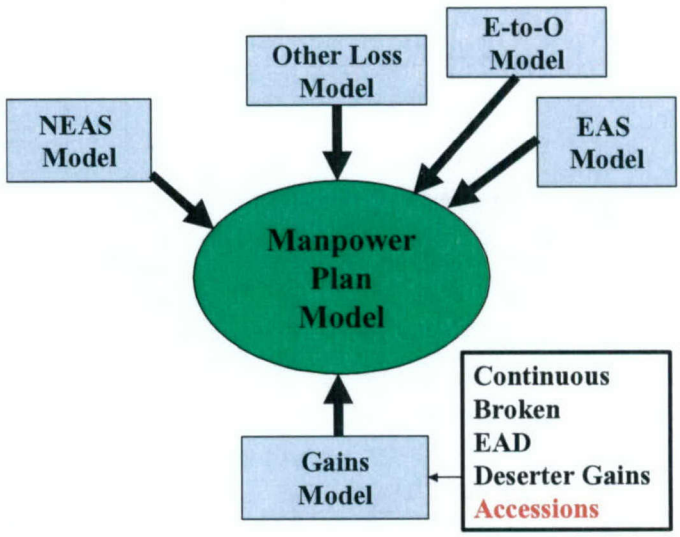
Figure 13 shows the gain categories and their relative sizes (on average). As noted in the figure, accessions are not forecast, but managed.

All gains components (besides NPS accessions) are forecast using the same process. In the paragraphs that follow, we describe the process

53. Enlisted Marines in the OCC class could be participating in the Meritorious Commissioning Program (MCP), the Marine Enlisted Commissioning Program (MECEP), or the Enlisted Commissioning Program (ECP). Although enlisted Marines usually are not in an OCC, they sometimes are because other classes have reached capacity.

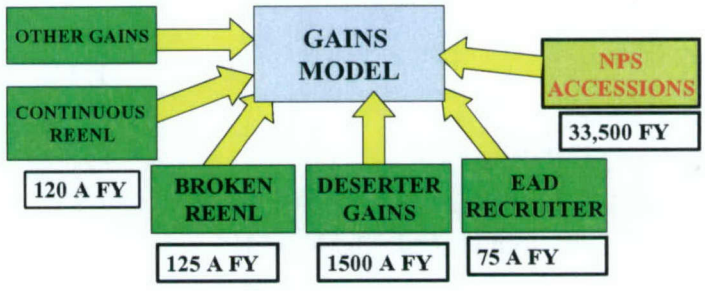
54. Attrition is not applied to the last month of OCS because all candidates either graduate from OCS in the third month or attrite. In either case, the net effect is a loss to enlisted endstrength.

Figure 12. Marine Corps endstrength models: Adding the gains model[a,b]



a. Briefing from the Enlisted Strength planners.
b. "Continuous" refers to continuous-service reenlistments (less than 90 days between separation and reenlistment), "broken" refers to broken-service reenlistments (more than 90 days between separation and reenlistment), and EAD stands for extended active duty—reservists who are called to active duty for recruiting.

Figure 13. Gains model[a,b]



1,800-2,000 GAINS FORECASTED EACH FY: ACCESSIONS ARE NOT FORECASTED, RATHER MANAGED.

a. Briefing from the Enlisted Strength Planners.
b. "Other gains" include implied gains (AZs), gains from reservists mobilized over a specified threshold (KMs), and gains from retired recalls. Continuous-service reenlistments are those separated less than 90 days, broken-service reenlistments are those separated more than 90 days, deserter gains are deserters who return to the Corps, EAD recruiter gains are the number of extended active duty recruiters returning to the Corps, and NPS accessions are non-prior-service accessions.

for broken-service and continuous-service reenlistments, noting that the process for forecasting other gains components would be identical.

As previously noted, the strength planners model in-year EAS continuation rates (essentially reenlistment rates) and then derive from them in-year EAS loss rates. There are, however, a small number of "reenlisters" who have separated from the Marine Corps but who re-enter. Marine Corps orders call them continuous- and broken-service reenlistments (separated less than and more than 90 days, respectively).[55] These two types of prior-service accessions are capped at 1,000 each.

The strength planners forecast continuous- and broken-service reenlistments by both a 4-year weighted average (WAG) of counts and Monte Carlo simulations.[56] The strength planners remove broken- or continuous-reenlisters who were counted as part of the FTAP (see figure 4 and the subtraction of the double-counts). If MCRC significantly changed the number of continuous- or broken-service reenlistments, conversations between the strength planners and MCRC throughout the year would ensure that new gains estimates would be constructed.

Once the planners have determined which estimate of monthly continuous- and broken-service reenlistments they will use, they distribute this number across paygrades using a weighted average of the historical paygrade distribution of these reenlistments. Figure 14 shows the results of such a process for estimating deserters, another gains component.

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55. We do not know why the Marine Corps chooses to characterize them in this way; there may be different procedures for continuous-service and broken-service reenlistments.

56. In the examples that follow, weights for all WAGs in the gains model are .5 for FY03, .3 for FY02, .2 for FY01, and zero for FY00. Broken- and continuous-service reenlistments are contained in Memo-01.

Figure 14. Deserter gains[a]

Deserter Gains

GRADE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	
E-9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E-7	0	0	0	0	0	0	0	0	0	0	0	0	1	0.00043
E-6	0	0	0	0	0	0	0	0	0	0	0	0	3	0.001986
E-5	1	1	1	1	1	1	1	1	1	1	1	1	11	0.008335
E-4	3	3	3	3	3	4	3	3	3	3	3	3	36	0.027009
E-3	27	24	23	30	27	33	30	23	26	26	26	26	319	0.236858
E-2	46	41	39	52	45	57	52	39	44	44	44	45	547	0.405638
E-1	36	32	30	41	36	45	41	31	35	35	35	35	431	0.319742
TOT	113	101	95	127	112	140	128	97	108	109	108	110	1348	1
	113	101	95	127	112	140	128	97	108	109	108	110		

	DES RV	DES L	DES ML	DES H	Mean
OCT	108	103	113	131	116
NOV	112	90	101	145	112
DEC	85	66	95	112	91
JAN	124	116	127	147	131
FEB	123	104	112	131	116
MAR	142	108	140	164	137
APR	129	113	128	161	134
MAY	106	79	97	123	100
JUNE	109	88	108	139	112
JULY	107	81	109	143	111
AUG	129	64	108	156	109
SEPT	102	92	110	151	118
	1376		1348		1387

Month	WAG	SIM
10	113	116
11	101	112
12	95	91
1	127	131
2	112	116
3	140	137
4	128	134
5	97	100
6	108	112
7	109	111
8	108	109
9	110	118
	1348	1387

a. From the Enlisted Strength Planners' spreadsheet model.

Possible improvements to the gains model

In this section, we explore whether forecasting the net impact of deserters on endstrength (losses from deserters and gains from returned deserters) rather than the current method of forecasting deserters' loss and gain impact separately will provide us with a useful additional forecasting method.[57]

Deserter losses and gains

Deserters complicate the forecasting of gains and losses because an individual Marine can account for several deserter gains and losses, perhaps even within the period of a month.[58]

57. Doing this exclusively would mean that planners would lose their ability to adjust the forecast for current events. For example, in a war, desertions typically fall. The method does, however, provide a check.

58. Typically, a Marine must be in an unauthorized absence (UA) status for 30 days before he or she is categorized as a deserter, but a commander may put a Marine in deserter status sooner if he or she sees fit.

Over a fiscal year, however, we find that the number of gains and losses roughly seems to "even out." As table 29 shows, gains have been between 94 and 107 percent of losses over the past 4 years.

Table 29. Comparing deserter losses and gains

FY	Gains	Losses	Gains/Losses
FY2000	1566	1661	94.28%
FY2001	1635	1690	96.75%
FY2002	1474	1383	106.58%
FY2003	1194	1134	105.29%

One alternate strategy for forecasting the net effect of deserters on end-strength might be to base the total estimated number of deserter gains on the estimated number of deserter losses. For example, gains as a share of losses is 100.72 percent on average (see table 29). Thus, if we predict that deserter losses will be 1,371 for the next FY (based on a weighted average of historical counts), forecast deserter gains would be:

1,371 * 100.72% = 1,381.

These gains then could be phased monthly using the average share of historical gains by month (see table 30).

Table 30. Average of historical deserter gains phasing

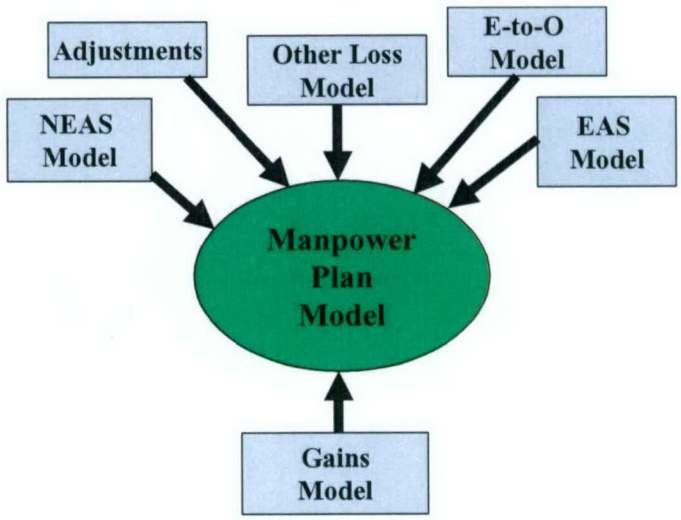
Month	FY2000	FY2001	FY2002	FY2003	Average
Oct	7.54%	6.91%	9.02%	8.71%	8.04%
Nov	9.45%	7.89%	6.99%	7.62%	7.99%
Dec	4.21%	6.85%	6.17%	7.62%	6.21%
Jan	9.26%	8.99%	8.68%	10.05%	9.25%
Feb	8.30%	8.01%	7.60%	8.71%	8.16%
Mar	9.58%	10.09%	7.39%	12.48%	9.89%
Apr	8.17%	9.91%	9.02%	9.63%	9.18%
May	8.05%	7.34%	7.87%	6.87%	7.53%
Jun	7.34%	8.50%	8.41%	7.37%	7.91%
Jul	8.37%	8.01%	9.91%	6.87%	8.29%
Aug	10.09%	9.42%	10.24%	6.20%	8.99%
Sep	9.64%	8.07%	8.68%	7.87%	8.57%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

The advantage of linking deserter gain and loss forecasts is that if one is overforecast, the other will help to offset it. The disadvantage is that our current NEAS forecasting method includes deserters in the historical loss counts, so they would have to be removed before using this alternate method.

Adjustments

Adjustments are the last component of the manpower plan model (see figure 15).

Figure 15. Marine Corps endstrength models: Adding adjustments[a]



a. Briefing from the Enlisted Strength planners.

Once all losses and gains have been forecast, the strength planners add in accessions until the endstrength target is met (it is in this way that accessions are managed rather than forecast).[59] But not all accessions that shipped will post in the same fiscal year (current guidance

59. This "solves the model"—replacing the proxy accession number described earlier.

allows a 5-day window to post accessions). To determine the magnitude of this adjustment, the strength planners determine on which day of the week the last day of the fiscal year falls. If September 30th falls on a Wednesday, for example, they estimate that accessions on Monday, Tuesday, and Wednesday would not have posted. Let us assume that the planners believe that 50 accessions a day will occur on these three days. Because there is no tolerance for finishing the fiscal year below the endstrength target, the planners must adjust to ensure that the target is met. They would distribute 150 (the number of potentially unposted accessions) across the 12 months of the plan.

Promotion matrix

At the same time that the planners develop the execution year plan, they also develop a promotion matrix. To do this, they first compare beginning endstrength (which is given by the endstrength at the end of the previous fiscal year) to the endstrength distribution they have set for the end of the fiscal year (using the process described in figure 3). The FY04 distribution (in the September column in table 31) was reported in column C of table 2. They then divide the difference between the beginning and end FY endstrength numbers by 12 and distribute this across the intervening months as a first cut at monthly gradestrength. For example, in table 31, the E9 difference (1,403 - 1,423)/12 = -1.67 is spread across the intervening months.

Table 31. First cut at determining enlisted gradestrength goals over FY04[a]

Grade	BEG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
E9	1423	1,421.33	1,419.66	1,417.99	1,416.32	1,414.65	1,412.98	1,411.31	1,409.64	1,407.97	1,406.30	1,404.63	1403
E8	3509	3,502.50	3,496.00	3,489.50	3,483.00	3,476.50	3,470.00	3,463.50	3,457.00	3,450.50	3,444.00	3,437.50	3431
E7	8677	8,684.67	8,692.34	8,700.01	8,707.68	8,715.35	8,723.02	8,730.69	8,738.36	8,746.03	8,753.70	8,761.37	8769
E6	14353	14,377.92	14,402.84	14,427.76	14,452.68	14,477.60	14,502.52	14,527.44	14,552.36	14,577.28	14,602.20	14,627.12	14652
E5	23695	23,699.33	23,703.66	23,707.99	23,712.32	23,716.65	23,720.98	23,725.31	23,729.64	23,733.97	23,738.30	23,742.63	23747
E4	29021	29,081.67	29,142.34	29,203.01	29,263.68	29,324.35	29,385.02	29,445.69	29,506.36	29,567.03	29,627.70	29,688.37	29749
E3	44525	44,347.08	44,169.16	43,991.24	43,813.32	43,635.40	43,457.48	43,279.56	43,101.64	42,923.72	42,745.80	42,567.88	42390
E2	19841	19,828.92	19,816.84	19,804.76	19,792.68	19,780.60	19,768.52	19,756.44	19,744.36	19,732.28	19,720.20	19,708.12	19696
E1	13989	13,886.83	13,784.66	13,682.49	13,580.32	13,478.15	13,375.98	13,273.81	13,171.64	13,069.47	12,967.30	12,865.13	12763
Total	159033	158830	158628	158425	158222	158019	157817	157614	157411	157208	157006	156803	156600

a. From the Enlisted Strength Planners' spreadsheet model.

Now the planners determine how many monthly promotions this distribution implies. To do so, they combine the beginning and end of month gradestrength counts with the number of gains and losses forecast earlier (see table 32). For example, taking beginning E9 gradestrength for October, we know that beginning gradestrength + losses - gains would be the end-of-month gradestrength if there were no promotions. In this example:

1,423 + 17 - 1 = 1,407.

Table 32. First cut at estimating FY04 monthly promotions by grade[a]

		TOTALS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	BEGIN	1423	1423	1421	1420	1418	1416	1415	1413	1411	1410	1408	1406	1405
	LOSSES	198	17	16	16	16	18	17	16	16	15	18	18	15
E-9	GAINS	7	1	0	0	1	0	1	1	1	1	0	1	0
	PROMIN	171	14	15	14	13	17	14	13	14	12	16	16	13
	END	1403	1421	1420	1418	1416	1415	1413	1411	1410	1408	1406	1405	1403
		TOTALS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	BEGIN	3509	3509	3503	3496	3490	3483	3477	3470	3464	3457	3451	3444	3438
	LOSSES	527	40	38	45	37	63	44	37	44	38	44	61	36
E-8	GAINS	17	1	1	1	1	1	2	1	1	6	1	1	0
	PROMOUT	171	14	15	14	13	17	14	13	14	12	16	16	13
	PROMIN	603	47	45	52	42	73	49	43	50	38	52	70	42
	END	3431	3503	3496	3490	3483	3477	3470	3464	3457	3451	3444	3438	3431

a. From the Enlisted Strength Planners' spreadsheet model.

We know, however, that the planners want to end October with 1,421 E-9s. Thus, they must promote into the E9 grade the difference between these two numbers:

1,421 - 1,407 = 14.

But promoting Marines to E9 means they will no longer be E8s. Thus, we see in table 32 that there are 14 promotions out of E8 in October. Given E8 estimated losses and gains, this means that promotions into E8 are:

3,503 - (3,509 - 40 + 1 - 14) = 47.

The planners perform this calculation for each grade through E1.[60]

60. They do not estimate promotions into E1 since these are not possible.

Once this has been done, the planners look at the monthly number of promotions in and out of each grade and determine whether changes in their timing are necessary. They change the timing by adjusting the gradestrength numbers in the intervening months in table 32. The planners may decide to change promotion timing based on one or more of several factors:

- To remove any negative promotions into a particular grade (i.e., a negative number in the "promin" rows of table 32)
- To satisfy monthly promotion goals set by the promotion planner
- To better match the usual promotion tempo observed
- To adjust the cost of the plan.

Table 33 reports the revised monthly gradestrength goals for FY04 after the planners have made adjustments. These adjusted numbers determine promotions in and out of each grade (through the process described above). Table 34 reports these numbers.

Table 33. Determining enlisted gradestrength goals over FY04: Adjusted distribution[a]

Grade	BEG Strength OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
E9	1423	1423	1422	1420	1417	1414	1410	1405	1403	1403	1403	1403	1403
E8	3509	3520	3525	3520	3515	3505	3495	3483	3470	3460	3450	3436	3431
E7	8677	8700	8730	8750	8749	8749	8745	8741	8741	8749	8760	8765	8769
E6	14353	14378	14403	14428	14453	14478	14503	14528	14553	14578	14603	14628	14652
E5	23695	23699	23703	23707	23711	23715	23719	23723	23727	23731	23735	23739	23747
E4	29021	29100	29300	29500	29600	29700	29700	29700	29700	29700	29700	29700	29749
E3	44525	44525	44400	44200	43900	43700	43500	43500	43000	42700	42500	42000	42390
E2	19841	19841	19700	19000	19000	19000	19000	19100	19100	19449	19449	19449	19696
E1	13989	13989	12517	12234	12402	12201	12288	12479	12403	12597	12600	12357	12763
Total	159033	159175	157700	156759	156747	156462	156360	156659	156097	156367	156200	155477	156600

a. From the Enlisted Strength Planners' spreadsheet model.

Table 34. Estimating monthly promotions by grade: Revised FY04 figures[a]

Grade		TOTALS	OCT	NOV	DEC
	BEGIN	1423	1423	1423	1422
	LOSSES	198	17	16	16
E-9	GAINS	7	1	0	0
	PROMIN	171	16	15	14
	END	1403	1423	1422	1420
		TOTALS	OCT	NOV	DEC
	BEGIN	3509	3509	3520	3525
	LOSSES	527	40	38	45
E-8	GAINS	17	1	1	1
	PROMOUT	171	16	15	14
	PROMIN	603	66	57	53
	END	3431	3520	3525	3520
		TOTALS	OCT	NOV	DEC
	BEGIN	8677	8677	8700	8730
	LOSSES	937	70	66	84
E-7	GAINS	61	8	2	1
	PROMOUT	603	66	57	53
	PROMIN	1571	151	151	156
	END	8769	8700	8730	8750
		TOTALS	OCT	NOV	DEC
	BEGIN	14353	14353	14378	14403
	LOSSES	1721	118	106	222
E-6	GAINS	594	185	7	7
	PROMOUT	1571	151	151	156
	PROMIN	2997	109	275	396
	END	14652	14378	14403	14428

a. From the Enlisted Strength Planners' spreadsheet model.

Process checklist

To organize the enlisted manpower process, we worked with the enlisted strength planners to create a process checklist with data references and notes (see appendix J). This checklist provides a "recipe" of sorts for the enlisted endstrength planning process, and it may be particularly useful to new planners as they try to learn the process.

Summary of improvements/modifications to the Enlisted Manpower Plan Model

Here we recap our improvements and additions to the Enlisted Manpower Plan Model:

- *Streamlined planner tool.* Worked with planners to create:
  - — Logically organized and linked worksheets

  - Organized storage of historical plans and scenarios
  - Reference tools for planners
    - Process checklist with data references and notes
    - "Optimizer" tool that helps planners set weights for historical data
    - Significant event database
- *Automated planner tool.* Worked with planners to create:
  - Automated summary for monthly endstrength reports
  - One-step weighting of data
  - The ability to experiment with weights
  - Automated updating and strength plan creation
- *Identified data inconsistencies.*
  - Suspicious patterns of loss transactions, which the contractor who manages the Marine Corps' manpower data is investigating.
  - Changes in the historical loss data over time. These may be a result of data-cleaning efforts, but this cannot be confirmed without SSN information.
- *Made several modifications/improvements.*
  - Developed a methodology for estimating future EAS populations
  - Verified that most NEAS attrition reasons (with the exceptions of recruit attrition and retirement) are best forecast together
  - Suggested forecasting deserter gains and losses together instead of separately
  - Recommended use of exponential smoothing, where appropriate

- *Suggested using different data to forecast losses.*
  - — Determined that information about the unemployment rate could improve retirement loss forecasts
- *Suggested apportioning recruit attrition between the accession month and the next month.*
- *Suggested forecasting all NEAS losses that are not recruit or retirement losses as a share of mandated endstrength.*
- *Developed loss scenario capability.*
- *Documented endstrength management processes.*

Officer Manpower Plan Model

Background

Officer strength planning is significantly different from enlisted strength planning. Because the enlisted planners can use force control measures to shape the population's grade and MOS distribution, enlisted losses determine accessions. In contrast, the officer planner has few force control measures,[61] so the stay-or-leave decision mostly rests with the individual officer. Whereas the enlisted strength planners can use force-shaping tools (e.g., the FTAP) to correct for underaccessing, the officer strength planner cannot easily adjust his inventory because of the long training pipeline for officers. The officer strength planner, therefore, accesses to meet a steady-state structure requirement.

The officer population is much smaller than the enlisted population, which means that resulting metrics are more sensitive to methodology modifications. Also, relatively small changes in annual losses can cause "spikes" in the data.

Information in this section comes from background research and interviews. The Officer Inventory Planner (OIP) from MP is responsible for planning, managing, and building the officer inventory.

Tasks of the Officer Inventory Planner (OIP)

The OIP tasks pertinent to this study include providing MCRC with officer accession planning guidance, developing endstrength

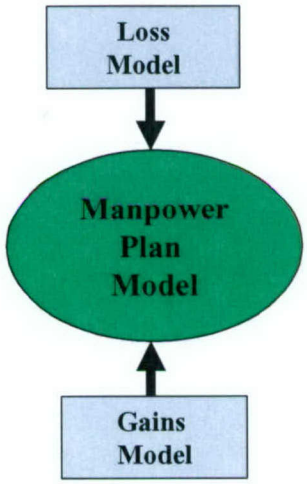
61. The officer force-shaping tools are accessions (ground, air, NFO, law), MOS assignments (at The Basic School (TBS)), career designations (formerly augmentations), and promotions. Of these, however, the OIP can directly affect the MOS distribution only with accessions and TBS (MOS) assignments.

projections, and producing officer endstrength plans for budgeting. The OIP's other tasks include quantifying MOS requirements for upcoming Basic Officer Course (BOC) graduates, assessing current and proposed policies based on his forecasts, and coordinating with the Aviation Inventory, Restricted Officer, and Officer Promotion Planners to assess the impact of various plans and initiatives.[62]

Overview

Figure 16 shows the two main components of the Officer Manpower Plan Model: the Loss Model and the Gains Model. As with the Enlisted Manpower Plan Model, all forecasts are made by month and grade.

Figure 16. Marine Corps officer endstrength models



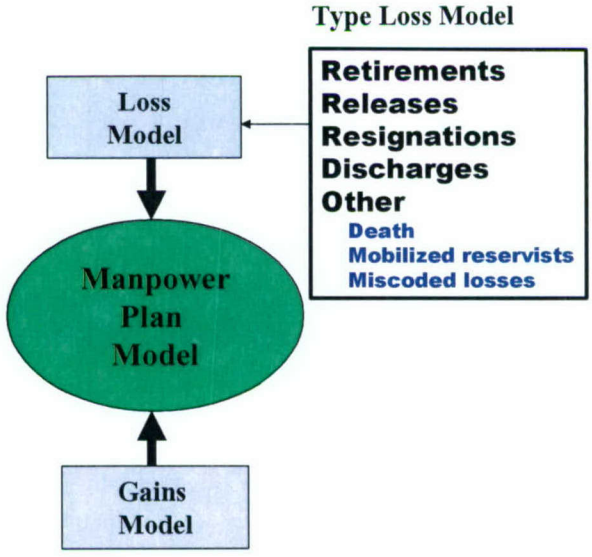
Although loss forecasting is the focus of our study, the officer endstrength planner also uses these models in the endstrength management process. As in the enlisted case, we summarize this process and its methods in appendix F.

62. Because the Marine Corps' General Officer population is fixed at 81 and operates under unique factors, we do not address General Officers in most of this study. The only exception is in our discussion of the promotion process.

Loss data

The Department of Defense (DoD) requires that the Services report officer losses as follows: (1) Retirements, (2) Releases (or EAS losses), (3) Resignations, (4) Discharges, and (5) Others (see figure 17).

Figure 17. Officer Type Loss Model



The Type Loss Model, which forecasts losses by each of the five types, is the OIP's primary loss-forecasting tool. We discuss each loss type in turn.

Retirements

Retirements, which are either voluntary or mandatory, occur when an officer leaves after 20 or more years of honorable active-duty service. Unrestricted officers in the rank of Captain or below who have twice failed selection to the next higher rank are involuntarily separated. Officers who have once achieved the rank of Major, however, are permitted by law to remain on active duty through 20 years of service and qualify for retirement. Those twice not selected for promotion to

Lieutenant Colonel are involuntarily retired at 20 years of service. As long as an officer has not twice failed selection to the next higher rank, he or she can continue to serve beyond 20 years of active service and voluntarily retire. For these reasons, 72 percent of retirements were Majors, Lieutenant Colonels, and Colonels. Warrant Officers, Limited Duty Officers (LDOs), and some officers with prior enlisted service who are able to achieve 20 years of active-duty service and retire at ranks below Major make up the remainder of retirements (see table 35).

Table 35. Retirements by grade (TFDW data FY98–03)[a]

Grade in descending order of retirements	Retirements	Percentage of all officer retirements
LtCol	1251	32%
Maj	1030	26%
Col	545	14%
CWO3	341	9%
CWO4	266	7%
Capt	201	5%
CWO2	162	4%
CWO5	132	3%
1stLt	1	0%
2ndLt	0	0%
WO1	0	0%
Total	3929	

a. For loss forecasting, the OIP uses hardcopy data, going back to FY89, which differ slightly from the TFDW data.

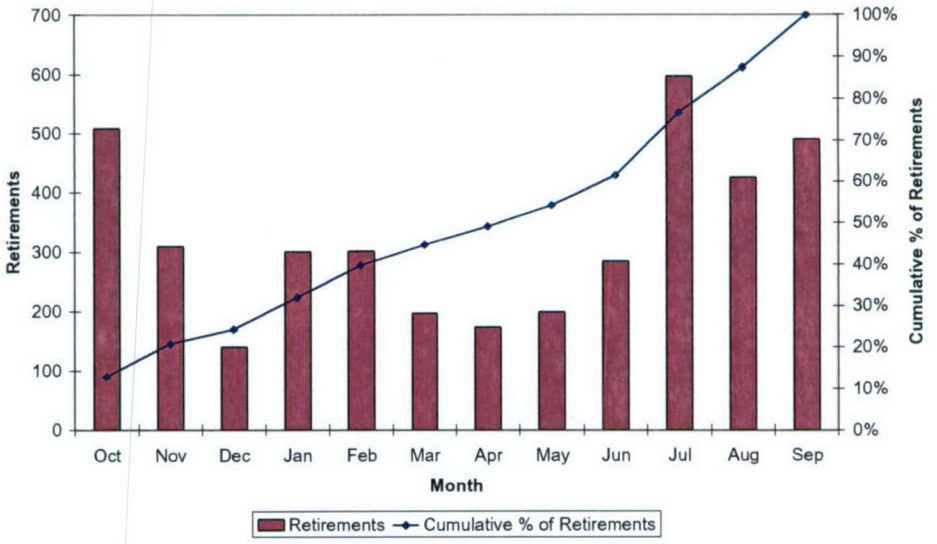
Figure 18 depicts the distribution of retirements by month. It shows definite seasonality, with over 40 percent of all officer retirements occurring in July through September.

Releases

A release occurs when an officer leaves the Service at his or her End of Active Service (EAS). EAS is determined by the officer's commissioning source and date: NROTC and USNA graduates' EASs are initially 5 years after commissioning, while all others' EASs are 3.5 years

after commissioning. Before their EASs, officers compete for career designation (formerly called augmentation).[63,64]

Figure 18. Retirements by month (TFDW data, FY98–03)[a]



a. For loss forecasting, the OIP uses hardcopy data, going back to FY89, which differ slightly from the TFDW data.

63. Officers with an EAS occurring before the board or after the board but before 1 September are generally given active-duty extensions through 1 September of that year.

64. Before 1997, officers commissioned from NROTC or USNA were given regular commissions. Officers commissioned from all other sources received reserve commissions and had to compete for career designation to receive regular commissions. Since 1997, all officers are given reserve commissions. Until 2000, officers were considered "all fully qualified" and were offered career designation before their EAS. During 2000-2003, career designation was tied to the Captain promotion board, meaning that officers selected for promotion to Captain were assumed to be fully qualified and were offered career designation.

If career designation is not offered, the officer is counted as a release when he or she is forced to separate.[65] If career designation is offered, the officer may informally accept, leading to a 2-year extension of active duty (EAD). During these 2 years, the officer should formally accept career designation. If, however, the officer chooses to leave the Service before formally accepting career designation, his or her departure also is classified as a release.[66]

Table 36 shows releases by grade, emphasizing that Captains and First Lieutenants account for most releases. As shown in figure 19, releases also show a definite seasonal pattern, increasing from March through October, which coincides with the timing of the career designation board results and extensions through the end of the FY.[67]

Table 36. Releases by grade (TFDW data, FY98–03)[a]

Grade in descending order of releases	Releases	Percentage of all officer releases
Capt	1377	54%
1stLt	838	33%
2ndLt	109	4%
Maj	74	3%
LtCol	50	2%
Col	45	2%
CWO4	12	0%
CWO3	9	0%
CWO5	7	0%
CWO2	5	0%
WO1	2	0%
Total	2528	

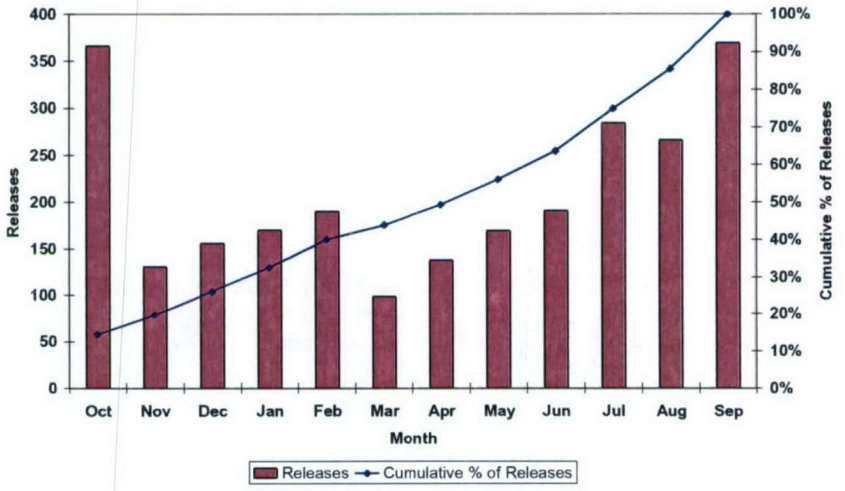
a. For loss forecasting, the OIP uses hardcopy data going back to FY89, which differ slightly from the TFDW data.

65. This is either at the officer's EAS or at the end of the fiscal year.

66. Once an officer formally accepts career designation, his or her EAS is listed as "indefinite."

67. End-of-the-FY releases apparently are neither strictly enforced nor diligently recorded, which explains the high number of October releases.

Figure 19. Releases by month (FY98–03)[a]



a. For loss forecasting, the OIP uses hardcopy data, going back to FY89, which differ slightly from the TFDW data.

Resignations

An officer who has accepted career designation (and thus has an indefinite EAS) and wants to leave the Marine Corps before becoming retirement-eligible must resign his or her commission.

The requirement to complete one's initial service obligation before resigning means that resignation-eligible officers usually have attained the rank of Captain. This explains the grade distribution of resignations (see table 37).

Like retirements, resignations occur more often in late summer/early fall. Furthermore, Also like in the case of retirements, Marines resigning must submit resignation requests 4 to 14 months before the requested separation date.

Discharges and Other

Officers' administrative departures (early out, high year tenure, reduction in force, convenience of the government, disability, etc.) are classified as "discharges." Figure 20 shows the monthly distribution of discharge losses.

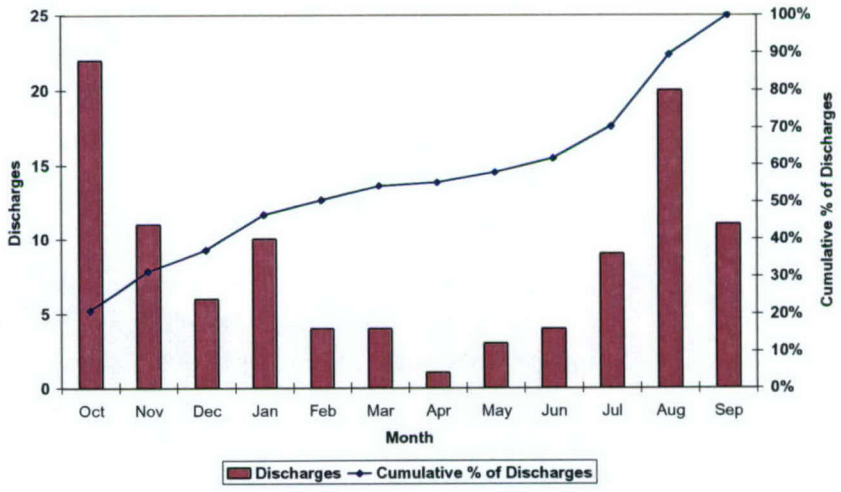
Table 37. Resignations by grade (TFDW data, FY98–03)[a,b]

Resignations By Grade

Grade in descending order of resignations	Resignations	Percentage of all officer resignations
Capt	1364	72%
Maj	431	23%
1stLt	97	5%
Grand Total	1905	

a. The data also include resignations of five CWO2s, four Second Lieutenants, two WO1s, one CWO3, and one Lieutenant Colonel.
b. For loss forecasting, the OIP uses hardcopy data, going back through FY89, which differ slightly from the TFDW data.

Figure 20. Discharges by month (TFDW data, FY98–03)[a]



a. For loss forecasting, the OIP uses hardcopy data, going back through FY89, which differ slightly from the TFDW data.

All other losses (e.g., death, miscoded losses, leaving reservists) are classified as "other."[68]

All losses

Taken together, we examine officer losses by type, from FY89 to FY03 (see figure 21). There is a noticeable decrease in losses from FY99 through FY03, with most of the decrease due to fewer resignations and releases.[69] Stop-Loss also contributed to fewer officer losses in FY03.

Difficulties in forecasting certain types of losses

Although figure 21 shows that smaller numbers of releases and resignations account for much of the recent declines in the overall loss rate, table 38 shows that they were the most challenging losses for the OIP to forecast.

Seasonality in resignations makes it difficult for the OIP to forecast resignations at the end of the fiscal year, since this period is most distant from the time of the forecast (which is typically in the late summer) and most resignations have not been submitted yet for this period.[70] That said, resignations planned for the first quarter of the FY should be known with more certainty than at other times or for other loss types. Although officers can "pull" separation requests (causing actual

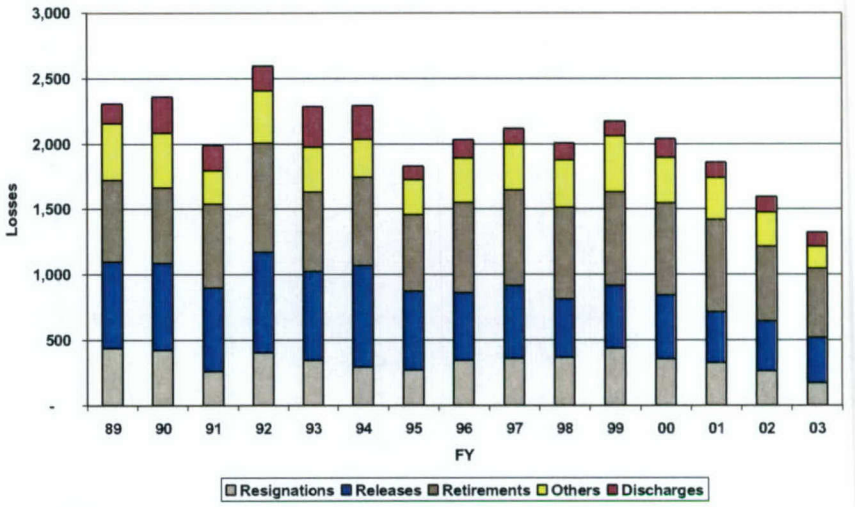
68. The gain and loss effects of mobilized reservists were historically included in the OIP's models since reservists mobilized beyond their 2-year orders could count against endstrength. (Reservists still needed beyond their 2-year orders were given Active-Duty Special Work (ADSW) orders for 270 days if deployed in support of operations, or 180 days if in support elsewhere. Officers continuing on active duty beyond that time counted toward endstrength and were considered gains.) The 2005 NDAA (signed on October 28, 2004) changed this practice. Now, mobilized reservists do not count against endstrength unless they accumulate 3 years of mobilized time in 4 years (and can even be extended an additional 2 years of ADSW orders before counting towards endstrength.)

69. Fewer releases are probably due to the less competitive nature of career designations in those years.

70. As previously noted, all Marines are required to submit resignation papers 4 to 14 months before separation. We discuss how these losses are forecast in the next section.

separations to be lower than those forecast), actual resignations in the first quarter should not exceed those forecast. Table 39, however, shows that there were positive deviations in the first quarter of FY04.

Figure 21. Total officer losses by type (FY89–03)[a]



a. OIP historical records as maintained in FY05 Loss Forecast.xls

Table 38. Average annual losses and weighted deviations for FY97–04

Type loss	Average losses	Average deviations[a]	Normalized loss weighted average deviations[b]
Releases	423	24%	29%
Resignations	326	24%	22%
Retirements	676	10%	20%
Discharges	112	54%	17%
Others	52	82%	12%

a. These are absolute deviations, measuring how high or low the forecast differed from the actual, regardless of direction. The aggregated difference between forecast and actual losses could be lower than the sum of these absolute deviations (e.g., if forecast retirements were 5 greater than actual retirements, and forecast discharges were 5 less than actual discharges, the overall forecast would equal the actual, even though the individual forecasts differed from the actuals by 10).

b. This column is a normalized weighted average of annual deviations (for example, 29 percent of the average deviation in losses comes from releases.)

Table 39. Positive resignation deviations (actual>fcst) FY04

Month	Actual	Fcst	+Dev: Act>fcst
Oct	39	31	21%
Nov	23	20	13%
Dec	17	15	12%
Jan	17	17	0%
Feb	16	15	6%
Mar	18	13	28%
Apr	18	15	17%
May	26	17	35%
Jun	35	27	23%
Jul	44	26	41%
Aug	49	26	47%
Sep	35	39	0%

Retirements are difficult for the OIP to forecast for the same reasons. Table 40 illustrates this point, showing that over half of the deviation in estimating officer retirements occurs in the last 3 months of the fiscal year.

Table 40. Monthly retirement forecast deviations from actuals, FY97–04

Month	Actual retirements	Forecast retirements	Absolute deviation	% deviation	% of overall deviation[a]
Oct	1372	1080	292	21%	11%
Nov	769	626	143	19%	5%
Dec	386	320	66	17%	2%
Jan	668	566	102	15%	4%
Feb	751	588	163	22%	6%
Mar	543	391	152	28%	6%
Apr	507	386	121	24%	4%
May	526	381	145	28%	5%
Jun	788	666	122	15%	5%
Jul	1830	1221	609	33%	23%
Aug	1384	993	391	28%	14%
Sep	1529	1138	391	26%	14%

a. This is the percent of overall deviation attributable to each month (the monthly deviation divided by the sum of all deviations).

Loss models

The OIP creates his loss forecast using the Type Loss Model and then uses a By-Grade Loss Model to gain insight on how to distribute losses by grade. We describe each of these models in turn.

Type Loss Model

The Type Loss Model uses weighted historical monthly averages to forecast monthly officer losses by type. It is in an MS Excel workbook, which includes a worksheet for each loss type, a consolidated results worksheet, and a historical data worksheet. Historical data are indexed by month, back to FY89,[71] and include losses in the ranks Warrant Officer 1 through Colonel.

We present the resignation loss forecast as an example, noting that the methodology used to forecast the other four loss types is identical. Although each loss type currently is forecast separately, the forecasts all use the same years and weighting for historical data.[72]

Table 41 shows historical resignation data from the Type Loss Model. The spreadsheet allows the OIP to select individual years of monthly data using the FY and weight selection cells (see figure 22). For example, the OIP uses the FY and weight selection cells shown to select 3 years (e.g., FY96, FY98, and FY00) of data and the weights for each year (e.g., 0.3, 0.5, 0.2) such that the weights sum to 1.

By applying these weights:

Forecast October Resignations = (33 * 0.3) + (38 * 0.5) + (28 * 0.2)

= 34.5, or 35 (see table 42).

---

71. TFDW data before FY98 are only provided quarterly, not monthly. Therefore, the OIP populated the FY89-FY97 database from historical paper records.

72. Thus, the current method produces the same result as forecasting all loss categories together. In a later section, we describe why one might want to weight losses differently and use different years of historical data, depending on the type of loss.

Table 41. Historical resignation data from the Type Loss Model

	Fiscal Year				
Month	99	00	01	02	03
Oct	35	28	30	49	31
Nov	37	21	36	24	26
Dec	29	16	19	13	15
Jan	17	22	26	21	13
Feb	13	13	13	15	9
Mar	22	16	14	8	9
Apr	29	18	18	7	1
May	36	33	21	16	1
Jun	53	54	26	27	5
Jul	52	43	39	18	10
Aug	58	53	38	22	22
Sep	52	36	54	42	35
Total	433	353	334	262	177

Figure 22. FY and weight selection cells

Wt	FY TO USE
0.3	96
0.5	98
0.2	00
1	

Table 42. Weighted average for resignations resulting from applying FY/weight selection cells[a]

Month	FY96	Wt	FY98	Wt	FY00	Wt	Likely
Oct	33	0.3	38	0.5	28	0.2	34.5
Nov	18	0.3	20	0.5	21	0.2	19.6
Dec	16	0.3	16	0.5	16	0.2	16
Jan	15	0.3	18	0.5	22	0.2	17.9
Feb	24	0.3	14	0.5	13	0.2	16.8
Mar	18	0.3	18	0.5	16	0.2	17.6
Apr	23	0.3	18	0.5	18	0.2	19.5
May	29	0.3	31	0.5	33	0.2	30.8
Jun	54	0.3	46	0.5	54	0.2	50
Jul	41	0.3	38	0.5	43	0.2	39.9
Aug	38	0.3	50	0.5	53	0.2	47
Sep	43	0.3	58	0.5	36	0.2	49.1

a. From the OIP's spreadsheet model.

Table 43 displays the maximum (High), average (Likely), and minimum (Low) values for each month. Continuing our October example, the Likely value is the weighted average of 34.5 rounded to 35, the High value of 38 comes from FY98, and the Low value of 28 comes from FY00.[73]

Table 43. Summary statistics for resignation data from FY96, FY98, FY00[a]

	High	Likely	Low
OCT	**38**	**35**	**28**
NOV	21	20	18
DEC	16	16	16
JAN	22	18	15
FEB	24	17	13
MAR	18	18	16
APR	23	20	18
MAY	33	31	29
JUN	54	50	46
JUL	43	40	38
AUG	53	47	38
SEP	58	49	36

a. From the OIP's spreadsheet model.

The monthly weighted average (for example, 35 forecasted October resignations from the Likely column in table 43) is linked to the Type Loss Model's consolidated worksheet, as shown in table 44.

As noted above, all other loss types are calculated similarly using the same methodology and weighting scheme.[74]

73. It might be useful to show the high and low values over all the years of data, rather than over just those years selected for weighting purposes.

74. As previously noted, since all loss types are currently estimated using the same FYs of historical data and the same weights, they are essentially forecast together rather than separately.

Table 44. FY05 forecast from the Type Loss Model's consolidated worksheet[a]

	Retirement	Release	Resign	Discharge	Other	Total
oct	104	88	35	10	4	241
nov	43	16	20	24	5	108
dec	29	23	16	8	4	81
jan	42	39	18	8	2	108
feb	58	28	17	10	1	114
mar	35	26	18	3	3	84
apr	40	34	20	11	4	107
may	30	27	31	6	4	97
jun	48	32	50	7	3	140
jul	117	52	40	8	4	220
aug	87	37	47	10	3	184
sep	87	50	49	9	5	201
						1685
total	718	451	359	115	42	

a. From the OIP's spreadsheet model.

By-Grade Loss Model

Once the OIP has forecast losses by type and summed them to derive total monthly forecasted losses, he uses the By-Grade Loss Model to estimate how to apportion these total monthly losses by grade. The output of the By-Grade Loss model is not connected to the Type Loss Model output. It merely gives the OIP a weighted historical monthly average of losses, by grade, to provide insight when he apportions the total number of monthly losses by grade.

The By-Grade Loss data are total monthly losses for the ranks WO1 through Colonel, from FY89 through FY03. Because TFDW data before FY98 are only quarterly, the OIP transcribed FY89–97 monthly totals from paper records. Table 45 shows a sample of the data in the model.

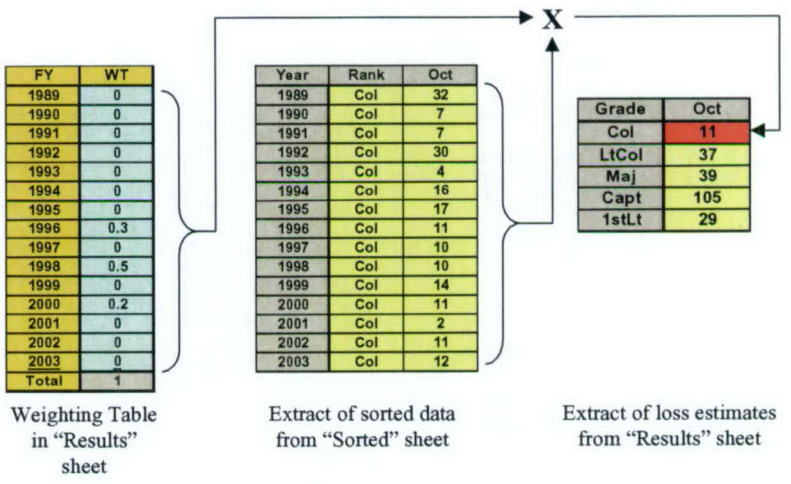
Figure 23 presents a snapshot of the By-Grade Loss Model's results worksheet, in which sorted historical data are weighted to provide the monthly by-grade loss estimate. As before, the weighting table allows the OIP to weight any combination of previous years' data. The weight vector is multiplied by a vector of annual losses for a particular grade, in a particular month. For example:

Forecast Col losses for October = 11*0.3 + 10*0.5 + 11*0.2 = 10.5, or 11.

Table 45. Example of historical data in the By-Grade Loss Model

FY89		Oct	Nov	...	Total
	Col	32	3	...	149
	LtCol	27	9	...	209
	Maj	27	13	...	228
	Capt	90	46	...	680
	1stLt	105	25	...	521
	2ndLt	6	1	...	53
	CWO5	0	0	...	0
	CWO4	3	4	...	44
	CWO3	2	4	...	29
	CWO2	3	1	...	22
	WO1	1	1	...	6

Figure 23. Weighted average calculation from the By-Grade Loss Model



The OIP then examines this monthly loss forecast by grade to gain insight on how to apportion total monthly losses by grade. Note that the total number of losses from the By-Grade Loss Model (1,690 in table 46) does not equal total losses from the Type Loss Model (1,685 in table 44)—a point addressed later.

Table 46. Monthly loss forecast, by grade

	Oct	Nov		Total
Col	10	8	...	96
LtCol	31	13	...	196
Maj	40	16	...	298
Capt	88	54	...	687
1stLt	30	6	...	205
2ndLt	2	3	...	30
CWO5	2	1	...	11
CWO4	11	4	...	61
CWO3	12	2	...	64
CWO2	3	3	...	37
WO1	1	1	...	4
				1690

Tables 47 and 48 show the final loss distribution for the FY05 execution year plan by type and grade.[75]

Table 47. Total officer losses, by type, from FY05 execution year plan[a]

MONTH	B/S	RES	DISCH	REL	RET	OTH	LOSSES
OCT	18839	26	2	85	101	17	231
NOV	18647	18	5	16	46	24	109
DEC	18642	18	8	23	25	22	96
JAN	18791	15	2	25	70	24	136
FEB	18749	17	8	28	56	47	156
MAR	18900	18	2	26	26	20	92
APR	19001	20	10	34	34	13	111
MAY	18933	30	6	50	30	18	134
JUN	18878	50	7	70	48	17	192
JUL	19032	40	8	75	117	7	247
AUG	18828	47	10	40	87	13	197
SEP	18824	49	9	70	87	5	220
TOTAL		348	77	542	727	227	1921

a. From the OIP's spreadsheet model.

75. The discrepancies in these numbers relate to mobilized reservists, who no longer count toward endstrength in the same way as previously.

Table 48. Total officer losses, by grade, from FY05 execution year plan[a]

LOSSES	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
GEN	3	0	0	3	0	0	0	0	0	1	0	1	8
COL	12	5	6	9	5	4	4	6	5	16	5	8	85
LTCOL	34	9	10	11	11	6	5	14	28	41	15	35	219
MAJ	40	14	12	24	30	12	25	25	35	62	37	48	364
CAPT	51	53	34	40	54	36	31	47	62	55	59	89	611
CAPT(E)	0	0	0	0	0	0	0	0	0	0	0	0	0
1LT	49	6	18	29	33	22	27	23	37	42	44	21	351
1LT(E)	10	1	4	6	7	5	6	5	8	9	9	4	74
2LT	5	7	2	2	2	0	5	2	2	4	9	5	45
2LT(E)	0	0	0	0	0	0	0	0	0	0	0	0	0
CWO5	4	0	1	1	0	1	1	1	2	1	0	0	12
CWO4	9	2	3	4	4	2	4	3	3	4	7	3	48
CWO3	11	4	4	6	6	4	3	4	4	5	8	2	61
CWO2	1	1	2	1	4	0	0	3	6	7	4	4	33
WO1	2	7	0	0	0	0	0	1	0	0	0	0	10
TOTAL	231	109	96	136	156	92	111	134	192	247	197	220	1921

a. From the OIP's spreadsheet model.

Possible improvements/modifications to the Loss Model

The OIP has made several significant improvements to the Loss Model since this study began. This section, however, suggests some additional model improvements/modifications that the OIP might want to consider.

Using Monte Carlo simulations

In addition to his current method, the OIP might want to forecast officer losses using a Monte Carlo simulation (as is done for category losses in the enlisted model). He may decide to use the mean value of all Monte Carlo iterations performed if these numbers appear to be more plausible than those resulting from the weighted average.

Using shares to distribute type losses by grade

As described above, the OIP's By-Grade Loss Model is completely separate from the Type Loss Model. As such, as in the example, the two models may produce different loss counts for a given FY. Currently, the OIP uses his judgment to reconcile the two estimates.

As an alternative, the OIP could use shares (that easily can be computed within the By-Grade Loss Model) to distribute by grade the total number of losses as calculated by the Type Loss Model. In addition to avoiding the creation of two different loss numbers, this would make the OIP's process more similar to that currently used by the enlisted endstrength planners.

First, the OIP would have to calculate the loss rate by grade for each FY (table 49 shows this calculation for FY03). The planner then could take an average (either straight or weighted) of historical loss rates by grade (table 50 shows a straight average of 4 years). Finally, the OIP would apply these average rates to the total number of losses derived from the Type Loss Model (reported in table 44). Table 51 gives these results. If officer endstrength increases, loss rates will probably produce more accurate forecasts than loss counts.

Table 49. Calculating historical officer loss rates by grade, FY03 example

Rank	Total Losses	Loss Rate
Col	92	0.08
LtCol	179	0.15
Maj	231	0.19
Capt	390	0.33
1stLt	132	0.11
2ndLt	25	0.02
CWO5	28	0.02
CWO4	28	0.02
CWO3	53	0.04
CWO2	30	0.03
WO1	2	0.00
Total	1190	1

Table 50. Calculating average officer loss rates, by grade

Rank	FY00	FY01	FY02	FY03	Average
Col	0.06	0.07	0.07	0.08	0.07
LtCol	0.15	0.16	0.14	0.15	0.15
Maj	0.17	0.17	0.18	0.19	0.18
Capt	0.37	0.35	0.32	0.33	0.34
1stLt	0.13	0.10	0.13	0.11	0.12
2ndLt	0.02	0.03	0.03	0.02	0.03
CWO5	0.02	0.01	0.01	0.02	0.02
CWO4	0.03	0.04	0.04	0.02	0.03
CWO3	0.03	0.04	0.05	0.04	0.04
CWO2	0.02	0.02	0.03	0.03	0.02
WO1	0.00	0.00	0.00	0.00	0.00
Total	1.00	1	1	1	1

Table 51. Officer losses, by grade, distributed using average historical grade shares

Grade	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Col	17	7	6	7	8	6	7	7	10	15	13	14	117
LtCol	36	16	12	16	17	13	16	15	21	33	28	30	254
Maj	43	19	14	19	20	15	19	17	25	39	33	36	299
Capt	83	37	28	37	39	29	37	33	48	75	63	69	577
1stLt	29	13	10	13	14	10	13	12	17	26	22	24	200
2ndLt	6	3	2	3	3	2	3	3	4	6	5	5	45
CWO5	4	2	1	2	2	1	2	2	2	4	3	3	29
CWO4	8	3	3	3	4	3	3	3	4	7	6	6	54
CWO3	10	4	3	4	5	3	4	4	6	9	8	8	69
CWO2	5	2	2	2	3	2	2	2	3	5	4	5	38
WO1	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	241	108	81	108	114	84	107	97	140	220	184	201	1685

Varying historical data/weights used

The OIP currently uses the same years and weighting for historical data to forecast each loss type. Thus, the current method produces the same result as if all loss categories were forecast together.

There may be good reasons, however, for the OIP to vary the weights and years of historical data used, depending on the specific type of officer loss being forecast.[76] For example, we saw in a previous section that the number of releases has fallen over the past several years. We hypothesized that this may be the result of less competitive career designations in recent years. The OIP probably will have a good sense of how competitive career designations will be in the upcoming execution year. If he believes they will remain less competitive, he might only use recent years' data on releases and perhaps weight the most recent year more heavily. There is no reason to believe, however, that these same years and weightings would make sense for another loss type (discharges, for example).

Appendix G contains additional information and techniques that may be useful as the OIP sets weights for historical data.

Forecasting losses based on aggregated categories

Making one forecast and then dividing it among the different types of losses (as is currently done) does not take advantage of potentially

76. In fact, this capability already exists in the OIP's spreadsheet models, but currently it is not being exploited.

different behaviors (e.g., resigning and being discharged are very different events). Forecasting every type of loss separately can introduce unnecessary error. Therefore, the goal is to have the minimum number of categories that reasonably capture the different types of behavior associated with different types of losses. Although the appropriate level of aggregation is a judgment call, we believe that three loss categories—self-initiated, EAS, and natural—might best capture this balance.

As we note in appendix C, the Army forecasts its losses separately by Programmed Managed Losses (PMLs) and Natural Losses (NLs). The reason for this is that the numbers of officers who will be forced to separate or who will retire are known with more certainty than NEAS losses and, therefore, are separated and categorized as PMLs. All other losses are collectively termed NLs.

Our proposed categories build on this concept. The self-initiated losses include retirements and resignations because the officer is choosing when to leave the Service[77] and because both have similar notification requirements.[78] EAS losses are just releases and, while a portion of releases reflect voluntary behavior (i.e., declining career designation), there is also a portion that reflects forcible separations (i.e., not being offered career designation).[79] Finally, we suggest forecasting discharges and other losses together as natural losses, a category that includes all apparently random losses. To use this forecasting methodology, historical data would need to be grouped in this way.

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77. Officers facing mandatory retirement still have chosen to remain on active duty through 20 years of active-duty service.

78. Retirement and resignation requests must be submitted 4 to 14 months before the requested separation date.

79. Truly basing categories on whether the officer left voluntarily (resignations, voluntary retirements, and voluntary releases) or whether the officer was forced to leave (mandatory retirements or not offered career designation) would be better for forecasting losses. Unfortunately, this is not how the historical data are maintained or how current data are categorized. Also, releases would still complicate this because officers would not likely admit to voluntarily separating before the career designation board.

Then, the OIP could do one of the following:

- Apply weighted historical averages to determine an annual loss forecast for each of the three categories, and then apportion the annual total by months or,
- Apply the exponential smoothing method (described in appendix G).

An illustration of this categorization. Examining actual and forecasted losses for FY00-FY05 (figure 24), we see that the OIP has reduced forecasts, in an attempt to catch the decreasing losses, and in FY05 increased his forecast based on the FY04 underestimate. Dividing losses into self-initiated, EAS, and natural losses (figures 25, 26, and 27) shows the particulars of the overestimates and underestimates. During FY00-FY02, releases were underestimated, while self-initiated and natural losses were overestimated.

Figure 24. Total losses: Actual and forecast, FY00–05

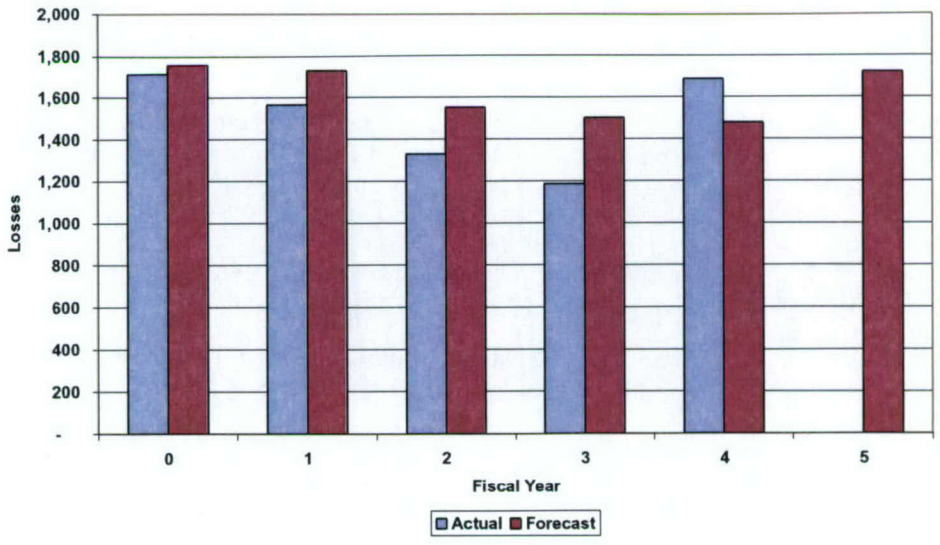


Figure 25. Releases: Actual and forecast, FY00–05

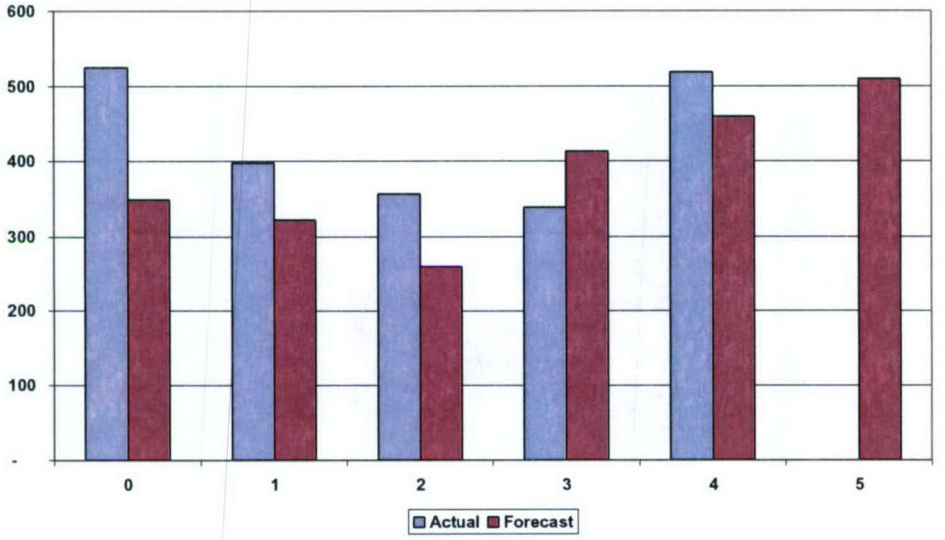


Figure 26. Self-Initiated losses (resignations and retirements): Actual and forecast, FY00–05

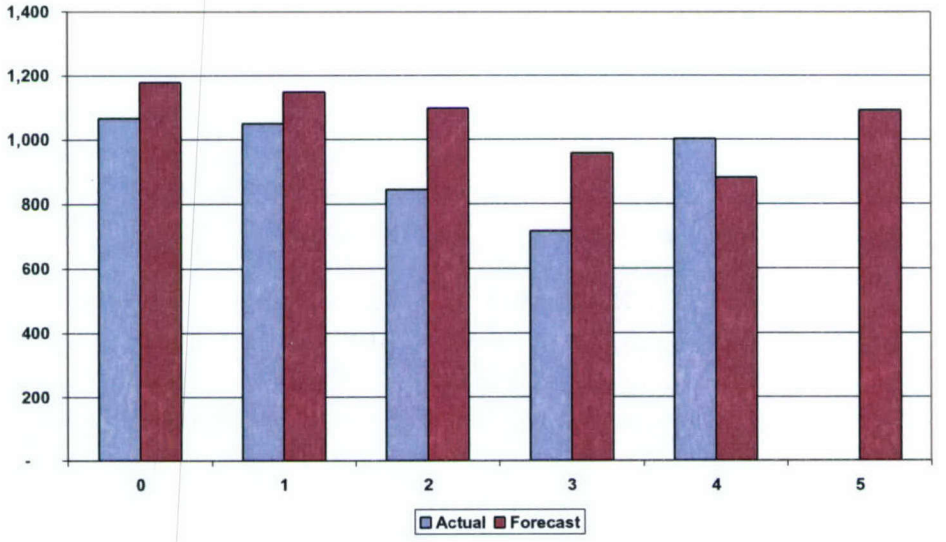
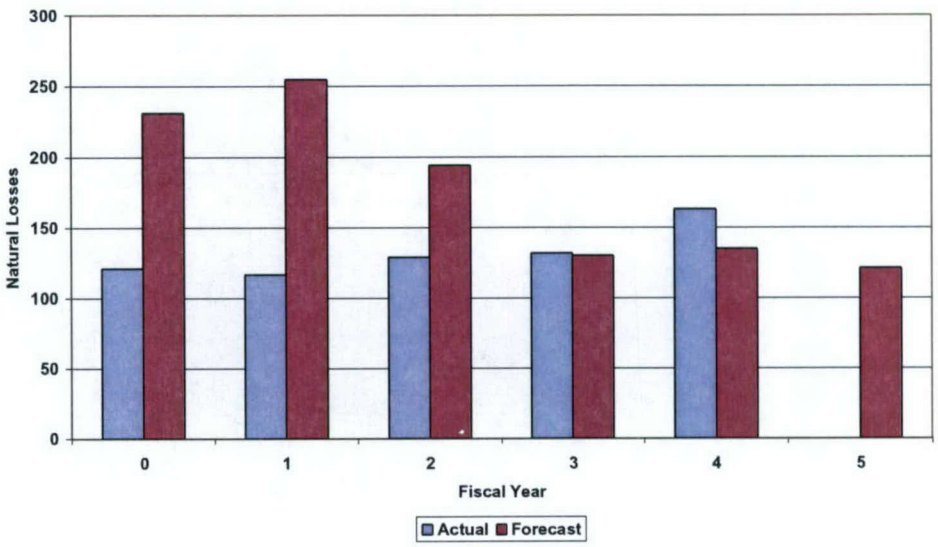


Figure 27. Natural losses (discharges and others): Actual and forecast, FY00–05



In summary, we believe that it may be useful for the OIP to examine officer losses in this way and to consider whether this categorization better captures behavior.

Using different data/methods

Whether the OIP forecasts with new or old data categories, he may find it useful to use different data/methods to forecast some loss types. For example, he could use additional available data, such as those available on planned retirements.

As previously discussed, the enlisted planners currently forecast retirements based on the ratio of planned retirements (those who filed retirement papers) to actual retirements in a given FY.[80] Because officers also must file retirement papers, this is probably an easily added method of forecasting officer retirements.

Table 52 shows the results of this calculation. Unlike in the enlisted case, however, there are not always more actual retirements than were

80. The OIP may want to use a similar calculation to estimate actual resignations using planned resignations.

planned. In FY00–03, the average of overstatements and understatements was only about 1.5 percent. Thus, to project actual retirements for FY04, the number of planned retirements at the end of FY03 (606) is increased by 1.5 percent—resulting in 615 projected retirements. Estimated officer retirements could be distributed monthly in the same way that retirements currently are distributed in the enlisted model—using average monthly retirements as a share of all average retirements and applying these rates to projected retirements.

Table 52. Projecting actual officer retirements based on planned officer retirements

A	B	C	D	E
Date	Planned Filtered Retirements	Date	Actual Retirement	Percent Retired
9/30/1988	606	9/30/1989	682	112.54%
9/30/1989	506	9/30/1990	631	124.70%
9/30/1990	543	9/30/1991	673	123.94%
9/30/1991	604	9/30/1992	900	149.01%
9/30/1992	385	9/30/1993	677	175.84%
9/30/1993	451	9/30/1994	719	159.42%
9/30/1994	475	9/30/1995	629	132.42%
9/30/1995	597	9/30/1996	731	122.45%
9/30/1996	680	9/30/1997	757	111.32%
9/30/1997	655	9/30/1998	713	108.85%
9/30/1998	744	9/30/1999	727	97.72%
9/30/1999	699	9/30/2000	713	102.00%
9/30/2000	646	9/30/2001	715	110.68%
9/30/2001	594	9/30/2002	582	97.98%
9/30/2002	563	9/30/2003	539	95.74%
9/30/2003	606	9/30/2004		
FY00-03 Avg				101.47%
Projection 04			614.884031	

As we recommended in the enlisted section, forecasting retirement losses based on planned retirements and the overall unemployment rate also might provide a useful alternative method.

We used data on planned retirements and the civilian unemployment rate to predict actual retirements in the FY89 through FY03 period. The equation was estimated by ordinary least squares. We found:

$$\text{Retirements} = 876 + Y - 0.05 \times \text{Planned retirements} - 35.60 \times \text{Unemployment rate}$$

Unfortunately, only the constant is significant at the 1-percent level and the adjusted R-squared for the equation is .11 (suggesting that the equation explains only 11 percent of the variation in actual retirements). Table 53 shows the data, as well as the forecasts and errors from the two described alternatives.

Table 53. Comparing retirement projections: Current method and proposed alternative methods

	Data (actuals)			Projected retirements			
	Retirements		Unemployment	1st alternative[a]		2nd alternative[b]	
FY[c]	Planned	Actual	rate	Forecast	Error[d]	Forecast	Error[d]
1989	606	682	4.5	615	67	686	4
1990	506	631	5.0	513	118	674	43
1991	543	673	6.4	551	122	622	-51
1993	385	677	6.4	391	286	630	-47
1994	451	719	5.4	458	261	662	-57
1995	475	629	4.8	482	147	682	53
1996	597	731	4.6	606	125	683	-48
1997	680	757	4.2	690	67	693	-64
1998	655	713	3.7	665	48	713	0
1999	744	727	3.5	755	-28	715	-12
2000	699	713	3.3	709	4	725	12
2001	646	715	4.2	655	60	695	-20
2002	594	582	5.3	603	-21	659	77
2003	563	539	5.6	571	-32	649	110

a. Uses FY01-03 average of planned retirements as a share of actual retirements.
b. Uses regression model.
c. Data for 1992 are omitted because of the drawdown.
d. This is the difference between actual retirements and the retirements forecast by this method.

To use this formula, the OIP simply inserts the number of planned retirements and the current unemployment rate into the formula. Then he distributes retirements by month as before. As we recommended in the enlisted section, this equation also could be used to estimate retirements in the out-years.

If some loss types were forecast separately, the OIP might want another method to forecast remaining losses. Although these losses now are

forecast as a historical average of *counts*, we believe that forecasting them as a historical average of *rates* might provide a good alternative method. (At a minimum, this could be used to check the current method.[81]) As noted in the enlisted section, such a method might become increasingly important as endstrength increases.

We first calculate all non-retirement losses (by month) as a share of congressionally mandated endstrength for the past 3 years. Table 54 shows this calculation for FY03 (when congressionally mandated endstrength was 175,000).

Table 54. Alternative method: Calculating historical loss rates, FY03 example

Month	Resignations	Releases	Discharges	Other	Total	Share of ES
Oct	31	57	4	5	97	0.06%
Nov	26	18	4	4	52	0.03%
Dec	15	15	7	2	39	0.02%
Jan	13	21	8	5	47	0.03%
Feb	9	17	4	3	33	0.02%
Mar	9	5	14	4	32	0.02%
Apr	1	6	5	6	18	0.01%
May	1	6	6	4	17	0.01%
Jun	5	2	4	12	23	0.01%
Jul	10	66	5	6	87	0.05%
Aug	22	63	7	1	93	0.05%
Sep	35	63	6	6	110	0.06%
Total	177	339	74	58	648	0.37%

Then, we average the monthly rates for three previous years (see table 55).[82] These loss rates are applied to the forecast congressionally mandated endstrength projection for the next fiscal year. If, for example, our endstrength projection is 175,000 for October of FY04, our forecast non-retirement losses for October would be:

175,000 * .05% (from table 55) = 88.

81. With only loss counts, forecasts include the inherent assumption that the population from which those losses came is relatively constant (which may or may not be a good assumption).

82. This can be a straight average (as shown in table 55) or a weighted average, depending on the planner's judgment.

Table 55. Alternative method: Calculating an average loss rate

Month	FY01	FY02	FY03	Average
Oct	0.04%	0.05%	0.06%	0.05%
Nov	0.04%	0.03%	0.03%	0.03%
Dec	0.04%	0.03%	0.02%	0.03%
Jan	0.03%	0.02%	0.03%	0.03%
Feb	0.04%	0.03%	0.02%	0.03%
Mar	0.02%	0.02%	0.02%	0.02%
Apr	0.03%	0.02%	0.01%	0.02%
May	0.03%	0.05%	0.01%	0.03%
Jun	0.05%	0.05%	0.01%	0.04%
Jul	0.05%	0.03%	0.05%	0.04%
Aug	0.05%	0.04%	0.05%	0.05%
Sep	0.08%	0.06%	0.06%	0.07%
Total	0.49%	0.43%	0.37%	0.43%

There also are a few ways that the OIP could check total losses. As the OIP has noted, officer losses are correlated with the civilian unemployment rate. Figure 28 shows this relationship. When the unemployment rate is high (meaning it is difficult to find a job in the civilian economy), the officer loss rate falls. In contrast, when the unemployment rate is low (meaning it is easy to find civilian employment), officers are more likely to leave.

We estimated the relationship between the overall unemployment rate and the overall loss rate for FY95–04. The estimated equation is:

Officer loss percentage = 14.97 - 1.18 x unemployment rate .

The variables are statistically significant and the adjusted R-squared is .43, suggesting that the equation explains 43 percent of the variation in officer loss rates. By inserting the expected unemployment rate,[83] the OIP can calculate the expected officer loss percentage.[84] This can "check" losses estimated by the primary forecasting method. Historical data for the loss rate regression are in table 56.

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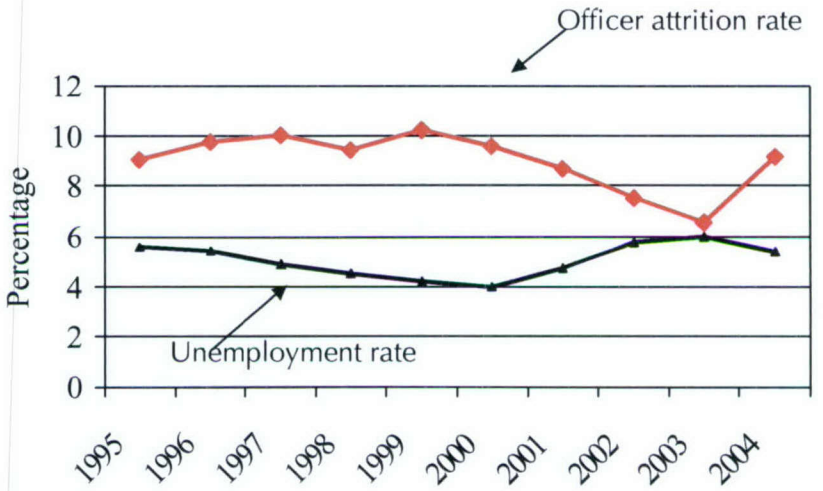
83. Forecasts of the U.S. unemployment rate are available at http://www.conference-board.org/economics/stalk.cfm.

84. This equation should probably be reestimated periodically as more years of data become available.

Figure 28. Relationship between the officer attrition rate and the unemployment rate[a]



a. Briefing from the OIP.

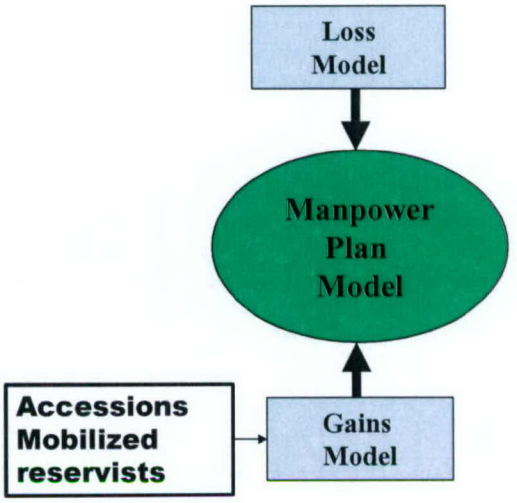
Table 56. Data for regression estimating officer loss rate as a function of unemployment rate

Fiscal year	Officer loss rate	Overall unemployment rate
1989	9.5	5.3
1990	10.9	5.6
1991	10.1	6.8
1992	11.4	7.5
1993	10.5	6.9
1994	11.1	6.1
1995	9.1	5.6
1996	9.8	5.4
1997	10.0	4.9
1998	9.5	4.5
1999	10.3	4.2
2000	9.6	4.0
2001	8.7	4.7
2002	7.5	5.8
2003	6.6	6.0
2004	9.2	5.5

Gains Model

The two main categories of officer gains are accessions and mobilized reservists (see figure 29). Unlike in the case of enlisted gains, the OIP has very little ability to affect the gains components.

Figure 29. Officer endstrength Gains Model



Accessions—The Year-Group Steady-State Model

As previously noted, the OIP accesses to a structure requirement, unlike the enlisted strength planner who accesses to counter losses. Each August, the OIP gives MCRC accession planning guidance (Planning Guidance Memo) with numbers based on results from what is called the Year-Group Steady-State (YGSS) model.[85]

Developed by Decision Support Applications, Inc. (DSAI), the YGSS model uses two inputs to develop its accession numbers: (1) a specific GAR, and (2) prior years' data on which to base loss rates.[86] The

85. Since we did not have access to this model, we only describe its inputs and outputs (i.e., we cannot examine its methodology).

86. Historical loss data can be further refined by type of officer (aviation, ground, etc.) and/or MOS.

model determines the number of commissioned officers that must be accessed to achieve the steady-state requirement as defined by the selected GAR. SAIC queries the data, which DSAI maintains.

The YGSS model output provides the basis for accession plan guidance (also known as "Memo 01") which quantifies the accession mission for the next two years, broken down by type of officer (Naval Aviators, Naval Flight Officers, Judge Advocates, and Ground Officers) as shown in table 57.[87]

Table 57. Accession mission from FY05 Planning Guidance Memo

	FY05	FY06
Naval Aviators	370	370
Naval Flight Officers	40	40
Judge Advocates	35	35
Ground Officers	941	895
Total Commissioned	1386	1340

MCRC uses this planning guidance to determine the number of commissioned officers[88] to access, by source. Officer accession sources include:

- United States Naval Academy (USNA)
- Naval Reserve Officer Training Corps (NROTC)
- Platoon Leaders' Course (PLC)
- Officer Candidates' Course (OCC)
- Enlisted commissioning programs:
  - — Marine Enlisted Commissioning and Education Program (MECEP)

87. Appendix B contains the full text of Memo 01.

88. The Restricted Officer Planner determines WO accessions (selected by a board from SNCO ranks) separately, but they are usually 250 per year.

— Enlisted Commissioning Program (ECP)

— Meritorious Commissioning Program (MCP).

If accession numbers need to be modified during the year, OCC is generally the only commissioning source available to adjust, since individuals from other sources are commissioned upon college graduation.[89]

Mobilized reservists

Mobilized reservists are considered gains for endstrength purposes after they have continuously served on active duty for a specified period of time beyond their original 2-year mobilization orders.[90] These gains are forecast in cooperation with the mobilization branch, without the assistance of a model.

Table 58 summarizes officer gains, by source, as reported in the execution year plan. The OIP distributes these gains by grade (see table 59).[91]

89. To enter OCC, a candidate must already have met any other commissioning requirements, so that the candidate can be commissioned upon graduation. However, the OCC can be reduced in size or delayed, to marginally affect a given FY's accessions.

90. As previously noted, a change in the 2005 NDAA now means that these individuals must be mobilized more than 3 years in the previous 4 years.

91. MPP-60 individually manages Other Gains (mobilizations), so their grades are known. WOs enter the officer inventory as WO1s. Gains from all other sources enter as 2nd lieutenants (except for lawyers, who may enter as 1st lieutenants).

Table 58. Officer gains, by source, in the execution year plan[a,b]

PLC	OCC	MECEP	NROTC	ACAD	WO	OTHER	GAINS	MONTH
1	0	4	26	0	0	8	39	OCT
78	0	0	2	0	0	24	104	NOV
3	158	61	4	0	0	19	245	DEC
52	2	10	7	0	0	23	94	JAN
18	2	12	4	0	250	21	307	FEB
2	158	16	1	0	0	16	193	MAR
11	1	5	13	0	0	13	43	APR
5	1	68	3	0	0	2	79	MAY
25	3	14	133	166	0	5	346	JUN
13	0	5	17	0	0	8	43	JUL
1	180	5	0	0	0	7	193	AUG
74	0	0	22	0	0	2	98	SEP
283	**505**	**200**	**232**	**166**	**250**	**148**	**1784**	
				1386				

a. From the OIP's spreadsheet model.
b. The top row lists accession sources described in the text, with "ACAD" standing for Naval Academy accessions, and "WO" standing for Warrant Officer accessions. "OTHER" gains are those mobilized officers who are forecast to count toward endstrength, and "GAINS" are total gains for all sources.

Table 59. Officer gains, by grade, in the execution year plan

GAINS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
GEN	0	0	0	0	0	0	0	0	0	0	0	0	0
COL	3	2	1	2	2	2	1	0	0	0	0	0	13
LTCOL	4	10	6	8	10	6	3	0	0	0	0	0	47
MAJ	0	8	3	5	5	12	0	0	0	0	0	0	33
CAPT	0	0	1	0	1	1	0	0	0	0	0	0	3
CAPT(E)	4	2	1	0	1	0	0	0	0	0	0	0	8
1LT	0	6	1	2	0	26	1	2	8	0	1	0	47
1LT(E)	0	0	1	0	0	0	0	0	3	1	0	0	5
2LT	28	74	183	60	30	142	28	61	266	32	154	78	1136
2LT(E)	0	0	46	15	8	4	7	15	66	8	38	20	227
CWO5	0	1	1	0	0	0	0	1	0	0	0	0	3
CWO4	0	1	1	0	0	0	0	0	2	2	0	0	6
CWO3	0	0	0	2	0	0	1	0	1	0	0	0	4
CWO2	0	0	0	0	0	0	0	0	0	0	0	0	0
WO1	0	0	0	0	250	0	2	0	0	0	0	0	252
TOTAL	39	104	245	94	307	193	43	79	346	43	193	98	1784

Promotion matrix

At the same time that the OIP develops the execution year plan, he also develops a promotion matrix. To do this, he first examines beginning endstrength (which is given by endstrength at the end of the previous fiscal year) by grade. Table 60 shows beginning FY05 endstrength by grade.

Table 60. Beginning endstrength by grade, FY05[a]

Grade	ES
GEN	81
COL	686
LTCOL	1878
MAJ	3510
CAPT	4010
CAPT(E)	1220
1LT	2674
1LT(E)	626
2LT	1833
2LT(E)	403
CWO5	87
CWO4	250
CWO3	557
CWO2	850
WO1	174
Total	18839

a. From the OIP's spreadsheet model.

The OIP also knows the endstrength at which he wants to end the year (his endstrength forecast for the next year, 18,702 in this example.) The Marine Corps promotes to vacancies, starting at the highest grade. The OIP starts by assuming that he must finish each month with the same number of Generals with which he started the month. As we saw in tables 46 (Officer losses by grade) and 59 (Officer gains by grade), the OIP expects to lose three Generals in October but does not expect to gain any in that month. Thus, to keep the number of Generals constant, he must promote three Colonels to General in October to counteract these losses (see table 61).[92]

Because promotions to General come from the Colonel population, these 3 General promotions mean there are 3 additional losses from the Colonel population. From tables 48 and 59, we forecast 12 Colonel losses in October and 3 Colonel gains, so from table 62 we see that

92. Note these are not actual promote-ins but merely the number required to balance the endstrength equation. The number of officers to promote each month is not modified unless there is a major divergence between the original plan and what actually occurs during execution. We assume this is to prevent oscillations in actual promotion dates.

the OIP promotes to achieve an end-of-month Colonel population of 680.[93] The OIP continues this process for each grade.

Table 61. General promotions over the course of the execution year[a]

GEN				
	OCT	NOV	DEC	JAN
	---	---	---	---
BEGIN	81	81	81	81
LOSSES	3	0	0	3
PR IN	3	0	0	3
END	**81**	**81**	**81**	**81**
AVG	81	81	81	81

a. From the OIP's spreadsheet model.

Table 62. Colonel promotions over the course of the execution year[a]

COL				
	OCT	NOV	DEC	JAN
	---	---	---	---
BEGIN	686	680	677	675
LOSSES	12	5	6	9
GAIN	3	2	1	2
PR OUT	3	0	0	3
PR IN	6	0	3	10
END	**680**	**677**	**675**	**675**
AVG	683	679	676	675

a. From the OIP's spreadsheet model.

93. This is done to meet his end-of-month goals by grade.

Summary of improvements/modifications to the Officer Manpower Plan Model

Our changes and additions to the Officer Manpower Plan Model follow:

- *Created reference tools for planner.*
  - "Optimizer" tool that helps planner to set weights for historical data
  - Significant event database
- *Made several modifications/improvements.*
  - Link two models by using grade shares calculated in the by-grade loss model to distribute losses calculated in the type loss model
  - Recommended that historical weights be varied, using:
    - Exponential smoothing, where appropriate
    - Optimizer tool
    - Significant event database
    - Planner's judgment
- *Suggested categorizing officer losses as:*
  - Self-initiated (retirements and resignations)
  - EAS (releases)
  - Natural (discharges and other)
- *Suggested using different data to forecast losses.*
  - Determined that information about planned retirements and the unemployment rate could improve retirement loss forecasts
  - Linked overall unemployment rate to officer loss forecast as check of other procedures
- *Suggested forecasting all losses as a share of mandated endstrength*
- *Documented endstrength management processes.*

Recommendations and conclusions

Recommendations

Create an SSN-based data file

All data used to forecast losses come from the TFDW, either directly or as part of one of several developed summary "cubes" (for example, the gains/losses cube). TFDW is relatively new, so its developers and users are still refining definitions. This means that data from a particular cube might not contain the most current data definitions in TFDW. As a result, it would be best to match up individual Marines (to ensure that a particular cube contains the Marines we hope it does). Unfortunately, only the TFDW contains SSN information (the cubes do not). Consequently, it is impossible to match individual Marines between a cube and the full TFDW.

To make this possible, we recommend that a new data file be developed that contains SSN information. One benefit would be that it would avoid the possible miscategorization of losses (for example, if a new category loss code is added that the planners miss, it would fall into "other losses" under the current methodology). At a minimum, this file should contain information that can be used to determine losses, including:

- Social Security Number (SSN)
- Separation Designator Number (SDN)
- Date of loss
- MCC of loss
- Active Duty Base Date (ADBD).

Consider adding civilian planner/consultant

The planners' job is a difficult one, which often requires knowledge of past trends and specific policies. Because the strength planners rotate out every 2 years, there is no one who can provide continuity over time. The Marine Corps values the "freshness" that new planners bring to the process, but adding a civilian planner/consultant might enhance their effectiveness—particularly when they are new to the job. In fact, several of the other Services use civilian consultants to support their endstrength planners.

Wait to hard-wire models

Over the course of this study, we made several modifications/improvements to the strength planners' models and spreadsheets. We recommend that planners become comfortable with these changes by using the models for several fiscal years before incorporating them into the Marine Corps' information system. Past experience suggests that it is both difficult and expensive to make changes to the models once they are hard-wired into the system.

Conclusions

This study was initiated because of concern about the importance of correctly forecasting endstrength losses and the dire consequences of inaccurate estimates. One reason estimates had been inaccurate in the past was the ad hoc nature of the forecasting loss processes. Since enlisted losses dominate, the situation was most critical on the enlisted side.

We first worked to make the process more systematic. Then, we focused on improving current methods or considering alternative methods. Alternative methods may become increasingly important to the endstrength planning process over time—particularly as the Marine Corps' endstrength increases in response to the Global War on Terrorism.

For the most part, our suggested improvements are not radical changes to the current process. Rather, they offer additional methods

that the planners can use to refine their loss forecasts. Refinements fall into five general categories:

- Separately forecasting elements that currently are forecast together, or vice versa
- Using currently unexploited data
- Creating new forecasting methods, including simple regression models
- Providing information/techniques for setting data weights
- Using exponential smoothing to forecast
- Improving the quality of the data currently used.

Finally, we documented all processes and provided several reference tools to assist planners in their work.

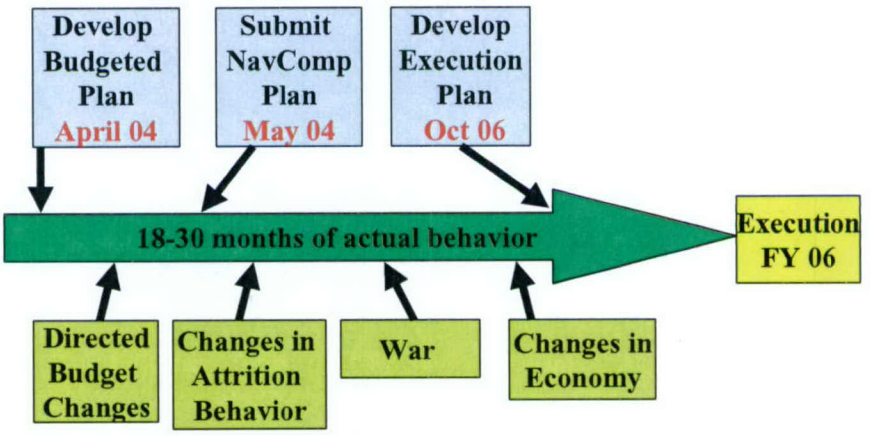
Appendix A: Marine Corps active-duty strength planning

Timelines for planning and budgeting

The budgeted endstrength plan

In April 2004, Marine Corps planners developed the budgeted endstrength plan for FY06. They submitted this plan to NavComp in May 2004, 16 months before the beginning of FY06. As figure 30 suggests, many events affecting personnel can occur between the development of the budgeted plan and the start of the execution year.

Figure 30. Planning and budgeting timetable for execution FY06[a]



a. Briefing from the Enlisted Strength planners. Although this figure shows the timetable for FY06, the same schedule would apply for any execution year.

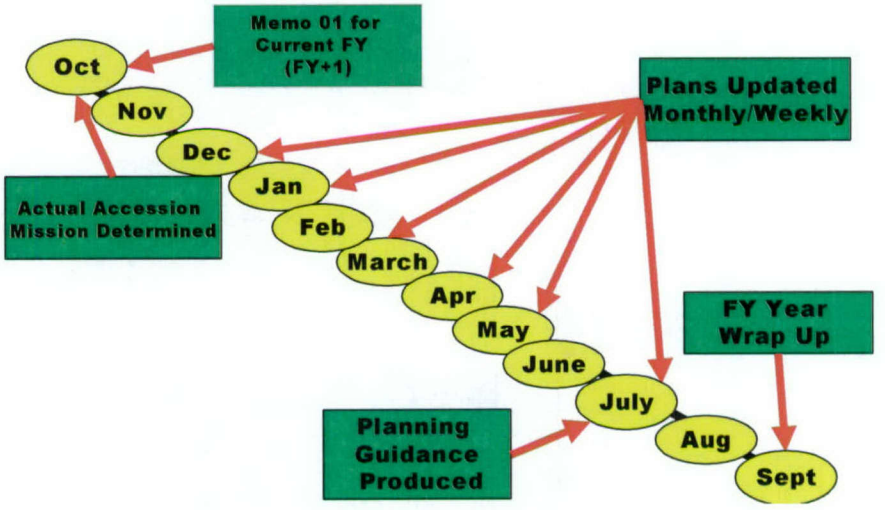
The execution plan (Memo 01)

In October 2006, the strength planners will develop the execution plan (Memo 01) for FY06. Memo 01 is a complete spreadsheet that details the execution year's forecast losses and gains by month and grade. The process described throughout most of this paper is that used to forecast the elements in Memo 01.

The accession plan (also sometimes called Memo 01)

There is a separate document, also called Memo 01, which Manpower Policy (MP) sends to Marine Corps Recruiting Command (MCRC) that details only the number of accessions for the current and next fiscal year.[94] Figure 31 details the execution year processes.

Figure 31. Endstrength: Execution year[a]



a. Briefing from the Enlisted Strength planners.

By October, MCRC typically has already recruited about 65 percent of the enlisted recruits who will enter during the current fiscal year,

94. See appendix B for the text of recent officer and enlisted accession plans (Memo 01s).

working from the prior year's plan and from conversations between MCRC and MP.[95] The planners develop the accession forecast for the next FY (called "Planning Guidance" in figure 31) in July by using May actual data as their best guess for the next FY's beginning endstrength and creating a plan that estimates accessions needed in the future FY.

The out-year plans

The planners will develop out-year plans for 6 years beyond the execution year (for example, if the execution year is FY06, they will generate plans for FY07–12) in association with a Program Objectives Memorandum (POM) or a Program Review (PR). These out-year forecasts are usually made in the spring. The plan 2 years out (in this example, FY08) is particularly important since it will be used to set that year's funding. In a later section, we discuss development of these out-year plans in greater detail.

Active-duty endstrength

Enlisted endstrength

To establish the enlisted portion of the FY06 endstrength target, the planners take the enlisted and officer percentages that result from the FY06 Table of Organizations (T/O)[96] and apply them to the congressionally mandated endstrength number (175,000).[97] This results in an enlisted endstrength target of 156,600 for FY06 (see figure 32).

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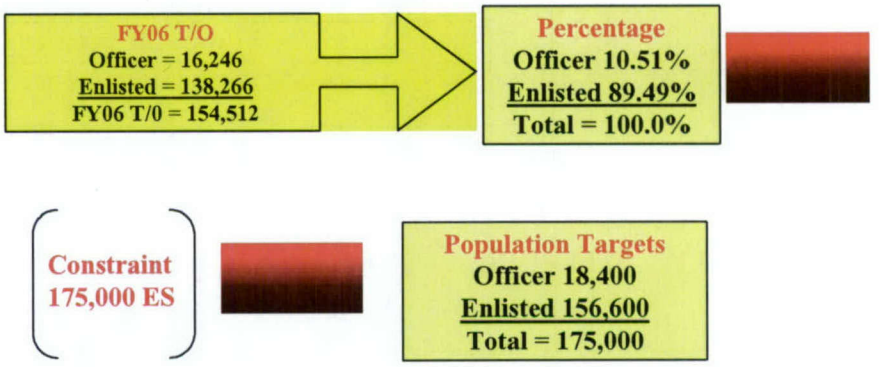
95. For example, MCRC recently announced that it had already recruited 53 percent of its FY05 recruiting mission by the start of the new fiscal year. Source: Gordon Lubold, "Recruiters at 53% of quota as new season kicks off," *Marine Corps Times*, Oct 18, 2004.

96. This is a listing of Marine Corps jobs and the grade levels needed to man them, which defines the Corps' requirements.

97. The Marine Corps (with the approval of Congress) recently decided to increase its FY05 endstrength to 178,000. Because it is still unclear how endstrength beyond FY05 will change or what the results of the associated Enlisted Grade Structure Review will be, we use 175,000 throughout this report.

Figure 32. Endstrength population target process[a]



a. Briefing from the Enlisted Strength planners.

The planners then must develop a target grade distribution for enlisted endstrength. They do so by examining three sets of numbers by grade: the T/O, the Authorized Strength Report (ASR), and a man-year estimate of the training, transients, patients, and prisoners count (T2P2).[98] Adding the T/O to the T2P2 gives them a desired number of enlisted in each grade; adding the ASR to the T2P2 gives them the authorized number by grade (see table 63).

The planners' enlisted endstrength target is 156,600. This number is smaller than the true requirement of 164,883 for the T/O + T2P2 (i.e., the validated billet requirement plus the number of Marines in T2P2 accounts). The requirement that approximates the funded requirement for FY06 (ASR + T2P2) is smaller than the true requirement (T/O + T2P2). FY06 is no anomaly; this is always the case.

Because the enlisted planners want to make sure that the plan they develop is adequately funded for senior enlisted (E6–E9) requirements, they use the T/O + T2P2 numbers (column 4) to set the proposed distribution for those grades. For grades E4 and E5, the planners use the ASR + T2P2 number (column 5). For grades E1 to E3, the planners use historical grade shares. The planners then total

98. Rather than a snapshot count of the number of Marines in T2P2 status, this number is a man-year average.

the proposed distribution (column 6) and determine what share of the total each grade number is, yielding the percent distribution (column 7). Finally, they apply these percentages to the enlisted endstrength number (156,600) to get the enlisted grade distribution.[99]

Table 63. Distributing FY06 enlisted endstrength by grade[a,b]

Column	1	2	3	4	5	6	7	8
				RQMT	RQMT	Proposed		Final
Grade	T/O	ASR	T2P2	T/O+T2P2	ASR+T2P2	Dist	Percent	Dist
E9	1475	1474	30	1505	1504	1505	0.96%	1502
E8	3600	3575	81	3681	3656	3681	2.35%	3674
E7	8036	7908	312	8348	8220	8348	5.32%	8331
E6	13762	13409	520	14282	13929	14282	9.10%	14254
E5	24102	22926	1790	25892	24716	24716	15.75%	24667
E4	33276	31038	2449	35725	33487	33487	21.34%	33420
E3	39336	36220	21272	60608	57492	38958	24.83%	38881
E2	14842	13529	0	14842	13529	19200	12.24%	19162
E1	0	0	0	0	0	12735	8.12%	12710
Sum E1-E3	54178	49749	21272	75450	71021	70893		
Total	138429	130079	26454	164883	156533	156912	100%	156600

a. Briefing from the Enlisted Strength planners. Yellow cells are determined based on historic grade shares.

b. Column 6 numbers, which have not been approved, are based on the Enlisted Grade Structure Review (EGSR). The EGSR, which is done about every 4 years, as needed, offers the only opportunity for significant changes in the enlisted grade distribution.

Table 64 shows the results of this calculation for FY02 to FY06. The enlisted endstrength planners create these numbers biannually.

Officer endstrength

As described earlier, the Officer Inventory Planner (OIP) establishes the officer portion of the FY06 endstrength target by taking the officer percentage resulting from the FY06 T/O (10.51 percent in our example) and applying it to the congressionally mandated endstrength number (175,000 in our example). This results in an officer strength target of 18,400 (see figure 32).

99. This is the planners' current process, which may change in the future.

Table 64. FY02 to FY06 enlisted endstrength distribution by grade[a]

	A	B	C	D	E
	FY02	**FY03**	**FY04**	**FY05**	**FY06**
E9	1370	1416	1403	1412	1502
E8	3272	3485	3431	3437	3674
E7	8900	8572	8769	8744	8331
E6	14440	14834	14652	14709	14254
E5	23035	23794	23747	23747	24667
E4	29743	29808	29749	29699	33420
E3	41906	42474	42390	42415	38881
E2	19449	19740	19696	19696	19162
E1	12597	12789	12763	12741	12709
Total ES	154712	156912	156600	156600	156600
Goal ES	**154712**	**156912**	**156600**	**156600**	**156600**

a. Spreadsheet from the Enlisted Strength planners.

The OIP then must distribute this endstrength number by grade and MOS by means of the Grade Adjusted Recapitulation (GAR) development process. The GAR presents the ideal endstrength distribution, by grade and MOS. Manning controls, derived from DOPMA and Title X, determine the GAR's grade distribution by distributing available endstrength by grade.[100] T2P2, the ASR, and the B-Billet plan distribute those officers among the MOSs, thereby determining the GAR's MOS distribution. Table 65 shows inputs used to develop the GAR.

The OIP then tries to develop an inventory of Marines of the appropriate number and type to meet the future GAR. Since the General Officer inventory is fixed by Title X, is always full, and represents a small, unchanging portion of the overall officer inventory, we do not address it in the following discussions.[101]

100.Total officer endstrength (18,400) minus General Officers (80) and Warrant Officers (1,950) leaves 16,500 commissioned officers to be distributed across the ranks of Lieutenant through Colonel. DOPMA restrictions govern the number and distribution of Majors to Colonels; the rest are equally divided between Captains and Lieutenants.

101.Source: http://assembler.law.cornell.edu/uscode/html/uscode10/usc_sec_10_00000526—000-.html.

Table 65. Distributing officer endstrength by grade[a]

Grade	T/O	ASR	T2P2	ASR + T2P2	GAR
O7 - O10	91	91	0	91	80
O6	678	646	18	664	664
O5	1790	1701	132	1833	1785
O4	3418	3256	373	3629	3481
O3	4824	4548	599	5147	5220
O1- O2	3443	3090	2049	5139	5220
WO	2018	1898	0	1898	1950
Total	16262	15230	3171	18401	18400

a. We use the FY09 GAR since it is most current and endstrength is still set at our example number of 18,400. T/O counts come from the Active Chargeable Officers (FY09).xls file provided by Total Force Structure Division, which was for the August 2004 Troop List. Remaining numbers are the roll-up from the FY09 Tango GAR.

Appendix B: Marine Corps Memo 01

Memo 01, which summarizes the strength planners' plan, is distributed as accession planning guidance to Marine Corps Recruiting Command (MCRC) and others. The first Memo 01 is usually distributed in September or October; revisions occur during the execution year. The following enlisted and officer examples are FY04's third revision and FY05's original guidance, respectively.

Marine Corps Memo 01 (3rd revision) for FY04 (Enlisted)

FY04 Active Duty Enlisted Accession Plan

1. General. The Active Duty Enlisted Accession Plan contains Marine Corps accession policy and actions for FY04 and an estimate for FY05. Any deviation from the plans and policies contained in the Enlisted Accession Plan must be coordinated in advance with the Director, Manpower Plans and Policy Division.

2. Accession Plan. The accession plan forecasts the number of accessions required to meet endstrength of 156,600 active duty, enlisted Marines. Enlisted endstrength in FY04 is based off the existing Marine Corps Requirement (T/O). The enlisted accession forecast is based upon FY04 loss estimates and we anticipate FY04 may be a volatile year for losses given anticipated future operations. The accession plan is subject to change as a result of revised loss estimates made throughout the fiscal year. The Enlisted Accession Plan is the official Marine Corps accession plan and must be executed in its entirety.

3. Forecasted Regular Accession Requirement.

The forecasted regular accession requirement for FY04 is 29,659 (27,377 Males and 2,282 Females). Prior Service accessions are limited to no more than 1000 of the regular accession requirement. The table below phases accessions in at 31/21/48 percent for each trimester. At no time should monthly shipping execution exceed 150

regulars above the FYTD plan as outlined in table 66. This table reflects the shipping changes from Memo 01.

Table 66. Shipping phasing for FY04

	Male	Female	Total	Cum
OCT	2659	113	2772	2772
NOV	2020	197	2217	4989
DEC	1759	118	1877	6866
JAN	2187	234	2421	9287
FEB	1343	189	1532	10819
MAR	1367	174	1541	12360
APR	1401	98	1499	13859
MAY	1419	165	1584	15443
JUN	3746	250	3996	19439
JUL	2673	277	2950	22389
AUG	3636	288	3924	26313
SEP	3167	179	3346	29659
	27377	2282	29659	

a. *Phasing.* Non-prior-service, regular accessions are phased into the following trimesters: 31 percent in the first trimester (Oct-Jan), 21 percent in the second trimester (Feb-May) and 48 percent in third trimester (Jun-Sep).

b. *Forecasted Regular Accession Requirement for FY05.* The regular accession requirement for FY05 is currently forecasted to be a total of 32,273 with male accessions at 29,991 and 2,282 for female accessions. This represents a substantial increase from FY04 and is primarily because of a projected lower beginning strength for FY05 and assumptions of increased attrition. This accession requirement is subject to change and will be updated throughout FY04–05.

Marine Corps Memo 01 for FY05 (Officer)

FY05 Active Duty Officer Accession Plan

1. To meet the projected Marine Corps officer endstrength through FY06, the following officer accession quotas are established (see table 67):

Table 67. Officer accession quotas

	FY05	FY06
Commissioned Officers	1,386	1,340
Warrant Officers	250	250
Total	1,636	1,590

2. Included in the above totals are the following officer category accession quotas (see table 68):

Table 68. Officer category accession quotas

	FY05	FY06
Naval Aviators	370	370
Naval Flight Officer	40	40
Judge Advocates	35	35
Ground Officers	941	895
Total Commissioned	1,386	1,340

3. MCRC shall ensure that they access to no more than 1/2% below and 2% above the assigned commissioned officer accession mission of 1,386 (1,379 - 1,413).

4. MCRC shall ensure that no more than 10% of all aviation accessions for a given fiscal year have an ASTB (Aviation Selection Test Battery) waiver.

5. An annual ceiling for the Meritorious Commissioning Program (MCP) is established. This ceiling will be set at no more than 28 (2 percent of the total lieutenant accession mission).

6. To ensure an even flow of aviation officers from TBS to flight training, the number of aviation officers assigned to each TBS class will be closely coordinated with MCRC, MPP-30, MMOA-3, TECOM (ATB) and MATSG.

7. Due to the inherently long nature of aviation training pipelines, no officer accession with an aviation (pilot or NFO) contract will be permitted to participate in post-graduate education programs prior to completion of their first FMF tour.

8. All Extension on Active Duty (EAD) authorization and reporting requirements, as outlined in the FY00/05 Marine Corps Accession Strategy w/change 1 of 2 October 2000, remain in effect.

Appendix C: Navy endstrength planning and forecasting

We met with Navy enlisted and officer strength planners (N132C) to discuss how the Navy does strength planning. The Navy is in the process of changing the strength-planning organizational structure. Where previously, strength planning was divided between enlisted and officers, future Navy strength planning will be consolidated into one strength-planning division, with officer and enlisted subdivisions, while the distribution of Sailors (assignment, done by detailers, the equivalent of Marine Corps Monitors) will be handled by Pers4. Below, we describe the enlisted strength-planning system as it previously existed and the officer strength-planning system as it currently exists.

Enlisted strength planning

The Navy has three core planners, the head of the enlisted strength-planning group, and a couple of supporting personnel. In addition, the contractor (RCI) maintains the enlisted strength-planning models and has two full-time and two half-time analysts working on Navy enlisted strength planning. Thus, the Navy devotes at least 9 man-years to enlisted strength planning.[102] Figure 33 shows the organizational relationships. These organizational relationships are similar to those in the Marine Corps, but the Marine Corps only has two enlisted strength planners.

102.In 132C, we met with: CDR Beth Kikla, Head Strength Plans (703-614-5406), assistant strength planners CDR Anne Hammond (703-614-5446) and LCDR Karl Werenskjold (703-695-3815), and the senior consultant from RCI, Ms. Anna Pruntseva (703-571-226-5121). This section draws on that discussion and the briefing that Ms. Pruntseva prepared.

Figure 33. Key organizational relationships for Navy enlisted strength planning

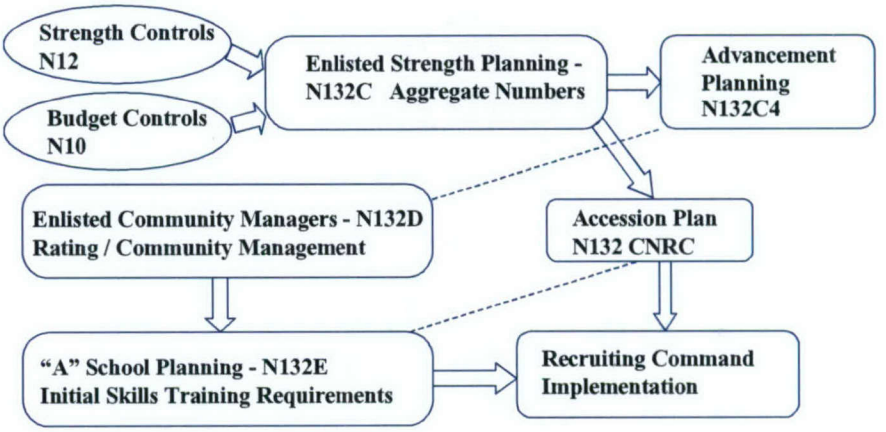
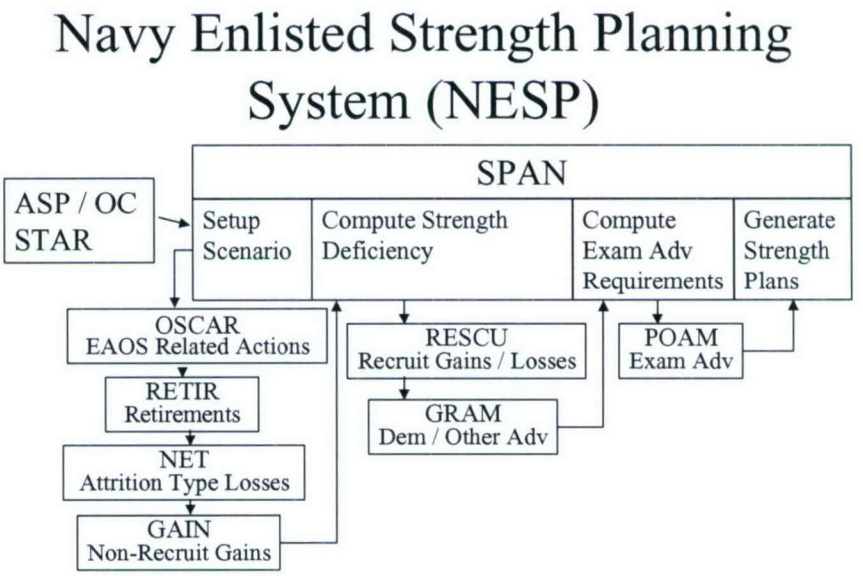


Figure 34 shows the Navy enlisted strength-planning system (NESP). SPAN (which is not an acronym) combines the output from seven event models. It is the report generator for NESP and computes required accessions and advancement vacancies. RCI developed SPAN and the seven event models over several decades; the models are continuously updated and improved through interactions between the Navy strength planners and the RCI programmers and analysts who support the model.

The system is very flexible, and there are many ways to run the models. For example, planners can impute the number of recruits or generate the required number of recruits by vacancies. Although the strength planners currently use rates from FY01, they can use whatever historical rates (in year chunks) that they desire. Model users also can read paragraphs describing the characteristics of any particular year, and how these characteristics might affect strength forecasting.

Navy strength planners spend a lot of time learning how to use the model, even with the RCI-provided support. Because Navy strength planners have this system and models to run various scenarios, they are more removed from the data than Marine Corps planners.

Figure 34. Navy Enlisted Strength Planning System (NESP)[a]



a. STAR (on the left-hand side of the figure) is the strength accession report that comes from the Enlisted Master Record file and is the actual endstrength. That endstrength can be compared to what the model calculates.

Models

Oscar (EAS losses, what the Navy calls EAOS losses)

The schedule of expected EAOS actions is refreshed monthly.[103] The model forecasts total EAOS actions by month separately for the active-duty regular Navy, active-duty reserves, and reservists identified as TARs.[104] The base is expanded by estimated early reenlistments.

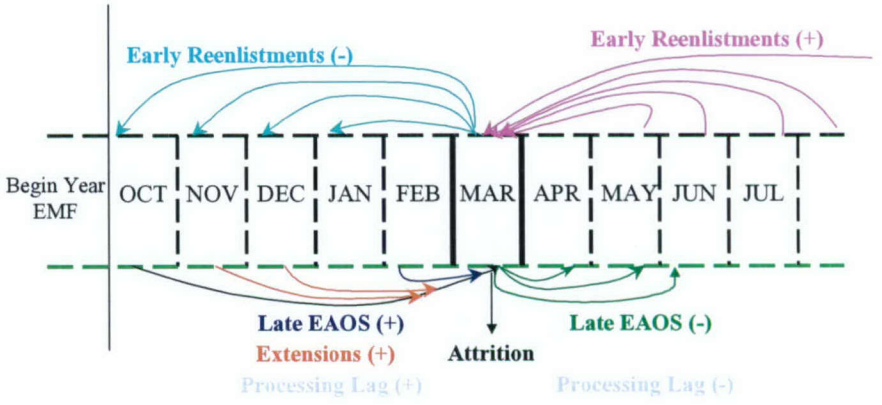
Special model features include the ability to model changes in retention policy, paygrades, and early releases. Figure 35 illustrates the

103. EAOS actions are EAOS losses, reenlistments, and extensions.

104. TARs must be forecast separately from active-duty reserves because Manpower and Personnel, Navy (MPN) pays for active-duty reserves (USNR), whereas Reserve Personnel, Navy (RPN) pays for TARs.

problems associated with forecasting EAOS actions. As in the Marine Corps, Navy strength planners count only processed actions.[105]

Figure 35. Navy EAOS forecasting problem[a]



a. From Navy strength planners' briefing.

RETIR (Retirement losses)

RETIR forecasts monthly retirement losses, by paygrade and length of service, based on the retirement-eligible population. As in the Marine Corps, the strength planners use a query system to learn approved retirement dates in the execution year. Unlike the Marine Corps model, the Navy model does not separate those who are newly retirement-eligible from those who were retirement-eligible in the previous year.

Special model features include specifications for a 15-year retirement policy (TERA), high-year tenure changes, and early-out retirements.[106] As with other models, RETIR forecasts the current fiscal year and seven out-years.

105. The Navy calls these processed actions, whereas the Marine Corps refers to them as posted actions, but both refer to the same thing.

106. The Navy model has evolved over many years, which probably accounts for why it retains the ability to forecast TERA's impact.

Whereas the Marine Corps puts retirement losses into the NEAS or attrition category, Navy strength planners categorize them as EAOS (or EAS) losses.[107]

NET (Attrition forecasting)

NET is a set of models that forecasts attrition by reason: physical, hardship, cause (drug and alcohol, desertion, misconduct, other cause), and miscellaneous (other miscellaneous, and incentive losses). The models use historical rates (selected by the user) and apply these loss rates to beginning strength by paygrade. Attrition reasons are projected separately.

GAIN (Non-recruit gain forecasting)

Non-recruit gains are planned prior-service accessions (either Navy or other-Service veterans) and the random gains from returned deserters.[108] These forecasts can be adjusted by paygrade and month. Deserter losses and gains are modeled separately in both NET and GAIN rather than being modeled together in the same model.

RESCU (Recruit scheduling model and recruit loss model)

This model calculates the number of recruits needed to meet end-strength and specifies monthly phasing for six recruit categories. For MPN, it specifies phasing for male and female regulars and reserves. For RPN, it specifies monthly phasing for male and female TARs. The user can specify monthly upper and lower bounds on the number of recruits, desired phasing, and whether the solution should be constrained or unconstrained.

The RESCU model also specifies recruit losses. The Navy and Marine Corps treat recruit losses differently. The Navy defines recruit losses as those that occur within the first six months—regardless of where

107.Because each loss model is independent, however, it makes no practical difference whether retirements are counted as EAS or NEAS losses.

108.Returned deserters go to Navy Transient Personnel Units (TPUs) from which they are discharged. Navy personnel thought that, because the Marine Corps does not have TPUs, gains from returned deserters would be more difficult to track.

the loss occurs or the loss reason. Figure 36 shows the model inputs for regular Navy losses. The Marine Corps could consider the implications of classifying recruit losses in the same way.

Figure 36. Inputs for recruit loss run[a]

•Based on pooled 2000 + 1999 + 1998 rates

• NPS Mix		• Month of Entry		• Month of Occurrence	
USN Male	14.45%	Oct	18.54%	Month of Entry	2.96% of entry cohort
USN Female	19.66%	Nov	18.89%	1st month	8.40%
		Dec	18.56%	2nd month	3.21%
		Jan	20.25%	3rd month	1.54%
		Feb	20.94%	4th month	1.34%
		Mar	21.82%	5th month	1.40%
		Apr	22.45%	6th month	0.80%
		May	16.90%		
		Jun	16.02%		
		Jul	13.68%		
		Aug	13.80%		
		Sep	14.50%		

a. Summing up attrition rates under months of occurrence gives entry-level attrition.

The Navy model distributes recruit losses over the months of service; unlike the Marine Corps model, it does not assume that recruit losses are distributed like accessions.

POAM (Petty officer advancement model)

POAM allocates advancements from examinations by advancement cycle and phases them over months. Authorized advancements are automatically carried over from year to year. Advancements are phased by level loading, historical distribution, or user specifications.

Advancements do not affect total endstrength, but they are modeled in the Navy Enlisted Strength planning system because of top 2 and top 6 grade restrictions. There is considerable interaction between the Navy enlisted endstrength group (N132C) and the community managers (N132D) on promotions. As in the Marine Corps, Navy promotions are by occupation (rating). The strength planners do not model rating; they give the number of advancements in each grade to the community managers, who distribute them by rating.

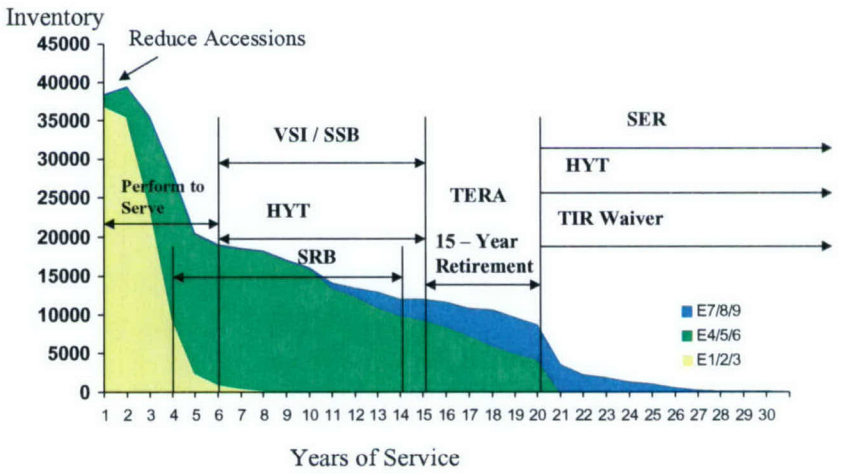
GRAM (Grade movement model)

GRAM forecasts other advancements and demotions. Forecasts are based on the E1–E3 beginning strength and the number of incoming recruits. The GRAM model basically deals with the E1–E3 grade structure.

Shaping the enlisted force

Figure 37 shows the various tools for shaping the enlisted force. All tools can be modeled in the Navy enlisted strength-planning models.

Figure 37. Navy strength planners: Shaping the enlisted force[a]



a. Briefing from the Navy strength planners.

To help achieve endstrength, the Navy also has started to exploit Involuntary Release for Active Duty (IRAD), while still holding Sailors to their Minimum Service Requirements (MSR). When enlistees enter the Armed Forces, they incur an MSR, which specifies amounts of active and reserve commitment time (e.g., with an 8-year MSR, one enlistee might be obligated to serve 6 years of active duty and 2 years in the individual ready reserves (IRR), whereas another might be obligated to serve 4 years of active duty and 4 years in the IRR.) If for a variety of reasons (e.g., not making qualification within a specified

period of time) the Navy considers an enlisted Sailor a candidate to be forced out, it now may issue an IRAD prior to the completion of the original active-duty commitment, while still holding the Sailor in the IRR until his or her MSR has been satisfied.

Data support for the Navy enlisted strength models

The two main administrative record personnel files are the Enlisted Master Files (EMF) and the personnel transaction files (AMON). Standard personnel measures (SPM) convert the transactions into strength-planning variables (gains and losses). The strength planners have daily SPM counts online. There are monthly updates to the NESP based on the EMF and SPM. These updates refresh the EAOS base, process reporting lags, and replace a month of the forecast with a month of actuals. Other data support includes PerSMART[109] and AMON historical databases, an enlisted cohort database, and a reporting lag database. These databases can be used to formulate different assumptions about the models (different years of data, different weights for years, etc.).

Reporting of endstrength information

There are no regular monthly endstrength briefings for N1 (the section does prepare monthly reports, but they are not briefed). There is a global annual update.

Officer strength planning

Navy officer strength planning follows a bottom-up approach. Community managers determine their communities' requirement and pass those requirements to the officer strength planners. The strength planners then compile and budget for an overall Navy strength plan (OPLAN), similar to the Marine Corps' Memo 01, for the upcoming FY. Throughout the execution year, OPLAN forecast data are replaced with actual data as they become available, and future forecasts are modified as required. Although predictions are

109.PerSMART is part of a retention monitoring system. It takes monthly snapshots of the entire EMF and archives them in a data warehouse.

based on paygrade, the officer strength planners are required to provide forecasts based on length of service (LOS), which is required for budget estimates. There is no community breakout of the forecasted strength plan. Whereas officer accession and promotion information has been stove-piped in the past, the strength shop is changing this, and looking to develop modeling support that will integrate loss assumptions.

For accessions, community managers determine their annual accession requirements based on loss assumptions that are consistent with the aggregate loss forecast assumptions. The officer strength shop compares the individual community loss forecasts with average historical loss behavior to ensure that it is reasonable. Community plans then are combined to generate an overall accession plan, which the strength planners phase by month throughout the year. Once N13 approves it, the overall accession plan is incorporated into the officer strength planner's overall strength plan, which is referred to as the OPLAN. Although there currently is no accession model, the strength-planning division is working to develop one. Until this is completed, the individual community managers will continue to provide the accession plans.

To develop their overall loss forecast, the strength planners use an officer loss forecasting model (WOLF) developed by Navy Personnel Research, Studies, and Technology (NPRST) and Computer Sciences Corporation (CSC). The planners use WOLF to derive a preliminary, Navy loss forecast for the upcoming FY, and then use their own judgment to modify the forecast attrition rate. The model currently allows them to use only one year of historical data to generate a forecast.

From a strength perspective, promotion planning is done similarly to accessions, with each community manager accounting for required promotions into, and out of, each grade. These are consolidated into an overall promotion plan, which explicitly specifies controlled grade promotions, that is presented to the strength planners once a year. This detailed promotion plan is strictly followed for the controlled grade promotions[110] throughout the FY. Adjustments to out-year pro-

110.Controlled grade promotions are for the ranks of O4, O5, and O6, which are specifically controlled by DOPMA.

motions are effected in the junior grade officers (O1–O3). Promotions in the Navy officer corps are competitive by category, where each corps has its own separate category[111] except for the unrestricted line.[112]

Every month, the inventory is available by community and by paygrade. During execution, the strength planners compare the endstrength target and loss behavior to determine if action will be required to meet endstrength.

The Navy works to meet endstrength requirements and, like the other Services, mainly modifies enlisted accessions to make adjustments.[113] It has recently focused on developing more force-shaping tools, including Perform-to-Serve and consideration of a new separation incentive pay.

111.Examples include supply, chaplain, and JAG.

112.Unrestricted line include officers from the surface, sub-surface, aviation, and SEAL communities.

113.As in the other Services, most officer accession sources have a long lead-time and, therefore, are not good for making short-term adjustments.

Appendix D: Army endstrength planning and forecasting

We met with the Deputy Chief, Strength Analysis and Forecasting Division, two enlisted strength planners, and two officer strength planners to discuss how the Army does its strength planning.[114] In this appendix, we address enlisted and officer strength planning separately.

The Army Strength Analysis and Forecasting Division's efforts are divided among three teams, each made up of three analysts; the Strength (overall) Team, the Enlisted Team, and the Officer Team.

Enlisted endstrength planning

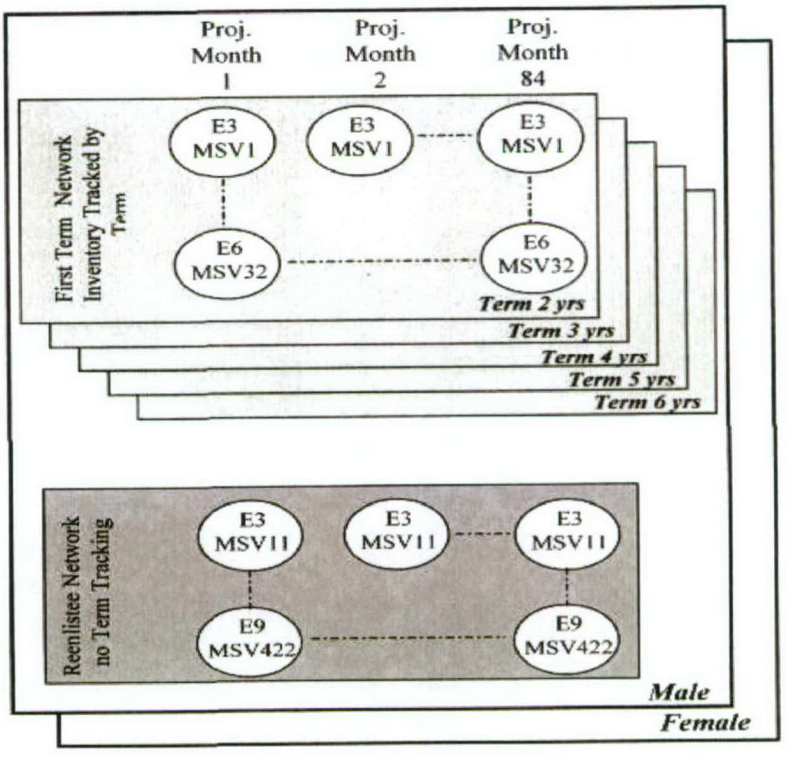
The Army has a family of models that has worked well over the past 30 years. However, it is currently updating its system because it wants a more comprehensive suite of models that resolve some coding issues inherent with models written in older computer languages. This is an expensive and personnel-intensive (that is, contractor-intensive) effort. Upon completion, Army strength planners will be able to break everything down to the MOS level, facilitating better integration of strength planning with other aspects of personnel and manpower management.

114.Army strength planning is located in the Deputy Chief of Staff (G-1/ Personnel), Headquarters, Department of the Army. Mr. Frank T. Watrous III is the Deputy Chief, Strength Analysis and Forecasting Division (watroft@hqda.army.mil, 703-692-5045). The other contacts were MAJ Karl Jehle (703-692-7298) and MAJ Dan Shrimpton (Daniel.Shrimpton@hqda. army.mil 703-692-7941). COL Galing is the Chief of the Strength Analysis and Forecasting Division.

The Enlisted Grade (EG) model

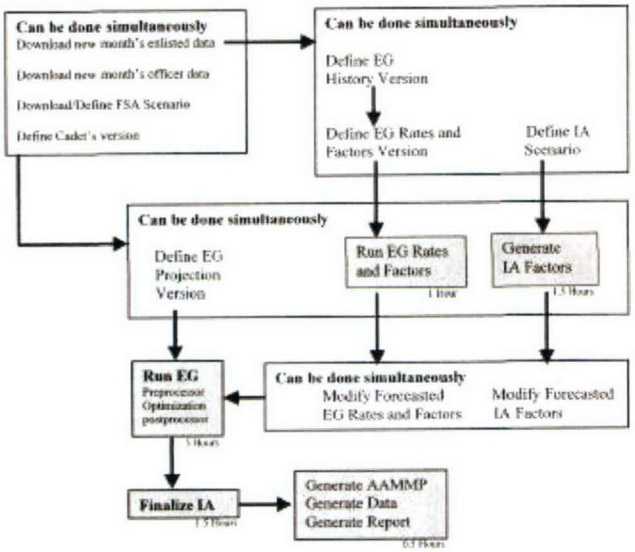
The current model, Enlisted Grade (EG), is a linear program with a large embedded network. It optimizes accessions and promotions to minimize deviations from a target, subject to user constraints. The embedded network is a series of six networks: five corresponding with length of initial obligation (called "term of service" by the Army) and one for reenlisters. Within each term of service, nodes are partitioned by grade, gender, month of service, and month of the projection (see figure 38). The model calculates the calendar year plus seven out-years, all in months, while both forecasting losses and generating accession and promotion missions. Figure 39 diagrams the current EG model's functions.

Figure 38. First-term network[a]



a. Briefing from the Army's strength planners.

Figure 39. Army EG model[a]



a. Briefing from the Army's strength planners. Times to run each section of the model are provided below the operations.

There are different "versions" within the EG model, with the Rates and Factors version being most pertinent to our study. This is the portion of the overall model that generates parameters for the embedded networks' node and arc structure, specifying each nodes' loss outflow as a percentage of that node's inflow. In the Rates and Factors version, the user selects historical data and a forecasting technique to apply to those data. Depending on current conditions, certain data periods might not seem appropriate to use as the basis for a forecast. For example, wartime administrative loss data are probably not useful for accurately forecasting peacetime administrative losses and, therefore, would not be included. The user also selects from various techniques (e.g., exponential smoothing, seasonal adjustments, moving averages) that in his or her judgment render the most appropriate forecasting rates and factors.

Another EG model module is the Individual Account (IA) model (what the Marine Corps calls P2T2). The model produces accession and promotion numbers. Therefore, the Army strength model explicitly incorporates more facets of the manpower process than does the Marine Corps' model.

Support and level of effort

Twelve officers and civilians perform Army strength planning, supported by four full-time contractors who focus on data problems. The EG model takes 7 hours to run, including pre- and post-processing (times for running the model's parts are shown in figure 39). This is after the data have been "cleaned"—a function performed by four full-time contractors that takes about 4-6 weeks.

The Army strength model, which is a considerably larger undertaking with substantially more support than Marine Corps efforts, allows Army planners to run many different scenarios. But because the model takes so long to run and its outputs are so voluminous, there are limitations on the number of scenarios that can be run. That said, the Army seems to benefit from the intensive time and manpower devoted to the model, as its forecasts appear to be quite accurate. For a force of approximately 480,000, the monthly forecasted losses for January 2004 were off by only 400.

Postings

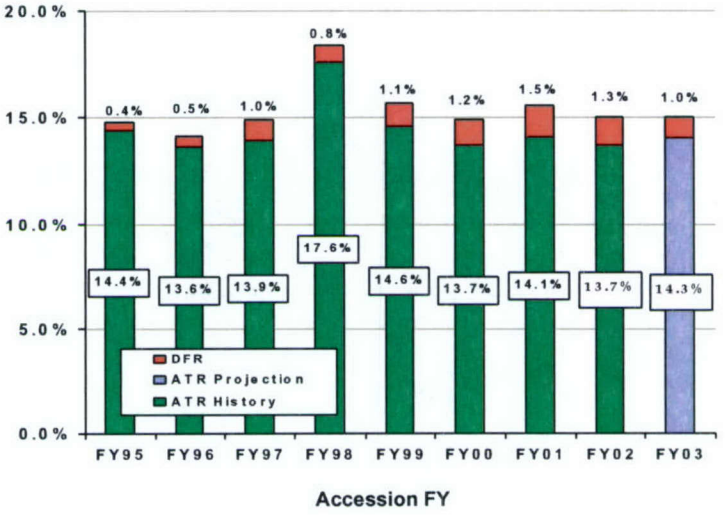
Unlike the Marine Corps or the Navy, which work with posted information, the Army works with actual dates of accessions and losses. Because entries are often late, the Army's endstrength reports are delayed 1.5 months on average. The Army keeps the endstrength counts open until the 10th day of the following month, using business rules to filter the last 10 days for transactions that occurred in the previous month. (Any transaction that occurs after the 10th of the following month, however, is counted in the month that it posts.)

Attrition

Early attrition

Whereas the Marine Corps accounts for MCRD attrition separately, both the Army and the Navy focus on *when* attrition occurs. *Any* attrition that occurs within the first 6 months of service—no matter where it occurs—is considered entry-level attrition. Army models track that attrition by cohort, as shown in figure 40.

Figure 40. Six-month cohort attrition[a]



a. Briefing from the Army's strength planners.

There are some advantages to this method of tracking entry-level losses—such as not having to monitor the losing activity's MCC and including only those within a certain time period.[115] Note, however, that the fidelity of the Army model enables this precision: the EG first-term network holds month of accession and month of loss (in addition to gender, term of service, and grade).

Subsequent attrition

The Army categorizes subsequent attrition as either adverse, administrative, drop from rolls, or non-disability retirements (which is different from the Marine Corps' categorizations). As in the Marine Corps, a soldier leaving the Army when he or she reaches the End of Term of Service (ETS) is not considered an attrite.

115. The Marine Corps records recruit losses from MCRD MCCs. If recruits are held back, these losses can be after a considerable length of time.

Correlating economic factors

In the past, the Army has attempted to tie loss behavior to economic factors. The greatest effect it found was a 55-percent correlation between reenlistments and unemployment. Army analysts saw huge spikes in reenlistments tied to bonuses, and a strong relationship between soldiers leaving the Service and the battalion command climate. The variables affecting behavior were transient, however, and it took a tremendous amount of time and effort to achieve this result. Even with the high fidelity of their data and the resources at their disposal, Army analysts concluded that there was limited value in trying to tie loss behavior to economic factors.

Officer strength planning

The officer team's main tasks are to provide officer allocation and budgeting numbers. The Army planners use two models to accomplish this: the Competitive Category Army Tracking System (CCATS) and the Budgeting Allocation of Resources for Notional Forces Model (BARON).

The officer team first uses the CCATS, which is a series of spreadsheet-based flow models, to derive a strength forecast. BARON, which is a costing model, then budgets that strength and matches it to the structure. The Human Resources Command (formerly PERSCOM) does the actual assignment of "faces to spaces."

The two areas of greatest uncertainty for Army officer strength forecasting are the losses and the requirement for Transient/Hold/Students (THS) structure. BARON accounts for THS uncertainty, while historical loss rates are calculated and entered into CCATS. Because our focus is on forecasting losses, we examine the CCATS model in more detail.

The CCATS model

Army officers are divided into five "Competitive Categories":

- Army Competitive Category (ACC) (consisting of the basic branches: infantry, armor, quartermaster, etc.)

- Army Medical Department (AMEDD)
- Judge Advocate Corps (JAG)
- Chaplain Corps (CHAP)
- Warrant Officers (WO).

Losses are forecast for each of these categories, by grade and month, and then are aggregated. The strength flow equation for a competitive category in a given grade and month is:

Endstrength = Begin Strength + [gains + promote in] - [losses + promote out]

Losses are divided into Programmed Managed Losses (PMLs) and Natural Losses (NLs). Officers who will be forced to separate for twice failing selection to the next higher rank or who will retire are known with more certainty than NEAS losses and, therefore, are separated and categorized as PMLs. All other losses (termed Natural Losses collectively) are estimated by applying a historical weighted average continuation rate to the beginning strength (see table 69).

Table 69. CAATS extract for Army Competitive Category (ACC) Colonels, June and July, FY04

	Jun	Jul
Beginning Strength	2,384	2,357
Gains	2	4
Promote In	61	29
Promote Out	35	4
Losses (Actual of both NLs and PMLs)	55	50
Natural Losses (Forecasted)	47	50
Programmed Managed Losses (Forecasted)	0	0
Stop-Loss[a]	55	2
Strength	2,357	2,338

a. Stop-loss numbers represent unrealized losses, i.e., losses that would have been incurred if stop-loss was not in effect.

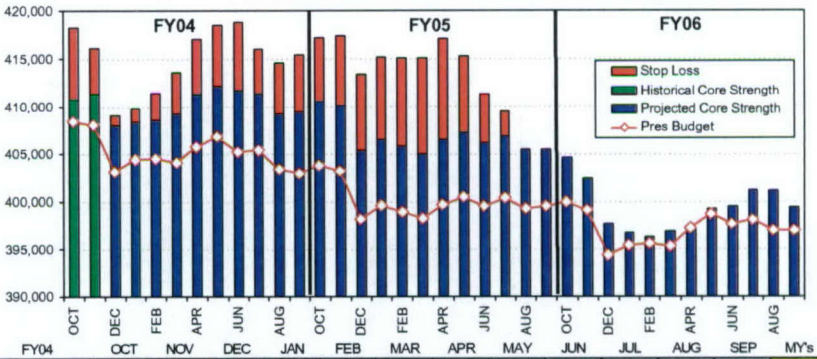
Table 69 is a sample extract from the CAATS spreadsheet model for ACC Colonels in June and July, FY04. The NL and PML rows contain

forecasts, whereas the Losses row equals the sum of the NL and PML forecasts only until actual data are available. Once actuals are available, the actual number of total losses plus those under stop-loss is entered.[116] The Promote In and Promote Out numbers are not planned or actual promotions; rather they are used to balance the strength equation.

Reports

The Army creates two monthly reports, the Program Update Brief (the PUB) and the Point Estimate report, which are presented monthly to the G-1 and track both enlisted and officer endstrength. Figure 41 shows active-duty enlisted strength tracking and figure 42 shows officer strength tracking (both from the PUB).

Figure 41. Active Army enlisted strength tracking (includes stop loss)[a]



FY04	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	MY's
History / Projected	418,276	416,143	409,091	409,845	411,439	413,549	417,029	418,549	418,783	416,039	414,534	415,433	414,865
FY05 PB	408,456	408,066	403,216	404,513	404,547	404,157	405,814	406,908	405,262	405,413	403,483	403,055	405,400
Delta	9,820	8,077	5,875	5,331	6,892	9,392	11,215	11,641	13,521	10,626	11,051	12,378	9,465

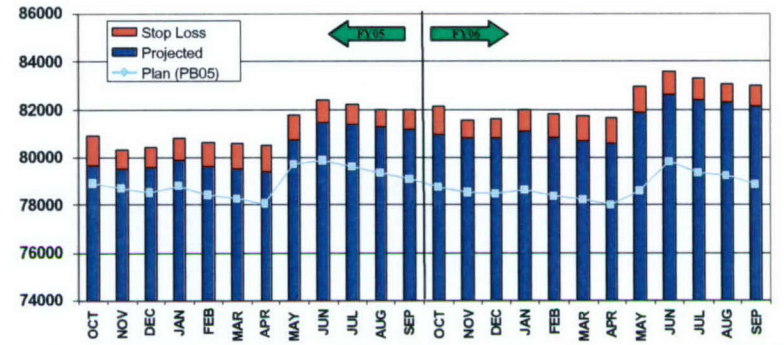
FY05	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	MY's
Projected	417,213	417,414	413,376	415,144	415,097	415,046	417,132	415,233	411,416	409,473	405,455	405,425	413,536
FY05 PB	403,859	403,247	398,229	399,649	399,005	398,293	399,740	400,529	399,536	400,470	399,326	399,567	400,266
Delta	13,354	14,167	15,147	15,495	16,092	16,753	17,392	14,704	11,880	9,003	6,129	5,858	13,269

FY06	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	MY's
Projected	404,620	402,403	397,657	396,695	396,327	396,907	397,083	399,212	399,504	401,187	401,110	399,372	399,592
FY05 PB	400,038	399,150	394,395	395,470	395,602	395,338	397,281	398,694	397,647	398,073	396,960	397,010	397,245
Delta	4,582	3,254	3,262	1,226	724	1,569	-198	519	1,857	3,114	4,150	2,362	2,347

a. Briefing from the Army's strength planners.

116.Actual losses are not separated again into NLs and PMLs.

Figure 42. Active Army officer strength tracking (in man-years)[a]



FY05	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Manyears
Plan (PB05)	78,937	78,703	78,547	78,787	78,438	78,263	78,074	79,693	79,888	79,596	79,319	79,057	78,949
Projected	80,854	80,288	80,385	80,778	80,607	80,541	80,512	81,767	82,420	82,201	81,997	81,976	81,151
DELTA	1,917	1,585	1,838	1,991	2,169	2,278	2,438	2,074	2,531	2,605	2,678	2,919	2,202
Core Projected	79,660	79,517	79,545	79,867	79,627	79,492	79,392	80,734	81,472	81,338	81,221	81,131	80,243

FY06	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Manyears
Plan (PB05)	78,765	78,553	78,491	78,641	78,409	78,216	78,020	78,614	79,803	79,362	79,224	78,890	78,756
Projected	82,125	81,543	81,631	82,005	81,809	81,725	81,678	82,915	83,544	83,290	83,061	83,010	81,409
DELTA	3,360	2,989	3,140	3,363	3,400	3,508	3,658	4,301	3,741	3,929	3,836	4,121	2,653
Core Projected	80,930	80,772	80,790	81,094	80,829	80,675	80,558	81,882	82,597	82,427	82,284	82,165	81,374

a. Briefing from the Army's strength planners.

As previously noted, the Army's use of actual rather than posted dates delays these reports. For example, the Point Estimate report for November 2003 was issued on 9 January 2004.

Whereas the Marine Corps' monthly endstrength briefs usually focus solely on the execution year, the Army's monthly briefs also address the out-years. However, the Army's briefs also contain considerably less detail about the execution year. This is, however, an unusual time, as the Army is considerably over the strength level in the President's budget.[117]

117. Army enlisted strength planners are now working on the decision in February 2004 to temporarily add 30,000 to Army strength for the next several years.

Appendix E: Air Force endstrength planning and forecasting

We met with representatives from the Personnel Operation Agency's Analysis Division and the Director of Personnel Resources' Endstrength team to discuss how the Air Force does its officer and enlisted strength planning.[118] The Analysis Division devotes 1 to 3 man-years to endstrength forecasting and maintains both enlisted and officer forecasting models. The Endstrength team has one full-time civilian who projects enlisted endstrength losses by month.

Enlisted endstrength planning

Models

The Air Force uses a combination of spreadsheet models and computer programs to manage enlisted endstrength. The Analysis Division forecasts enlisted losses yearly for up to 30 years into the future. Loss forecasts are made by year of service within grade, and career fields and are based on historical data going back 1 to 10 years.[119]

Enlisted losses also are forecast by Air Force Specialty Code (AFSC). These forecasts, which are subject to a greater margin of error than aggregate loss forecasts, are used mainly for promotion planning.[120]

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118. We met with Maj Thomas Clutz, AFPOA/DPXA (703-604-0651), Mr. Curt Lambert, AF/DPLFR (703-697-3714), and Capt Longhorn (703-604-1471).

119. A 1994 data system change made previously collected data of little use.

120. The Air Force used another model (developed by RAND in the 1980s) to forecast enlisted endstrength losses, but it was abandoned in the early 1990s due to its lack of maintenance, obsolete programming language, and incomplete documentation. An effort to update the model began in 1996, but an update proved to be neither feasible nor cost-effective.

The Analysis Division now calculates the accession goal in each year, using a steady-state YOS model. The Air Force has rarely revised the enlisted accession mission (even if it is projected to miss its end-strength target), but has come within a few hundred of the accession goal in the last several years.

The Director of Personnel Resources' Endstrength team does the loss forecasts used for resources and programming. This shop projects enlisted endstrength losses based on 2 to 3 years of historical monthly data (omitting data from any anomalous period).

The Division recently developed an "optimizer" that uses a sliding window approach to determine relative weights for the historical data used to forecast losses.[121] This tool has allowed the Air Force to cut its forecast error in half—FY03's loss forecasts were within 2 percent of the aggregate loss counts within broad career fields.

Posting

Enlisted endstrength loss information is accumulated over the course of the month. The posting period closes at the end of the month, and the monthly data are released 2 to 3 weeks later. Each monthly data release includes a revision to the previous month's figures (which may reflect losses that occurred but did not get posted within the month).

Effect of environmental conditions on loss forecasts

Like their counterparts in the other Services, Air Force planners use historical data—much of which has been influenced by environmental conditions unique to the period—to forecast losses. During the drawdown, for example, the Air Force used a wide array of loss programs to encourage Servicemembers to voluntarily separate. Conversely, stop-loss was in effect after 9/11 and in much of 2002. These unique environmental conditions can limit the reliability of loss forecasts based on data from these periods.

121. We have recommended that a similar methodology might help to improve the Marine Corps' loss forecasts.

The pattern of endstrength losses

About 10 percent of enlisted Air Force accessions attrite in basic military training (BMT). In total, about one-third of all enlisted personnel attrite before their first reenlistment point. Losses are highest in the summer months, despite the fact that the Air Force level-loads enlisted accessions. This is because careerists usually arrange their EAS dates to coincide with the summer months. First-term reenlistment rates currently are between 50 and 60 percent. Historically, enlisted personnel could reenlist up to a year before their EAS date; this was recently shortened to three months.

Margin of error for meeting endstrength

The Air Force currently is 18,000 Airmen, or 6 percent, above its authorized endstrength. However, a waiver is in effect that allows the Service to finish the fiscal year over authorized endstrength.[122] The Secretary of Defense has mandated that the Air Force be at its endstrength authorization by FY05—a target that may require the greater use of separation incentives if endstrength continues to surpass its authorized value.[123] Furthermore, if volunteers (guardsmen and reservists performing "special work") exceed 180 days of activation, they also will count toward endstrength—potentially raising the rolls.

As previously noted, Air Force strength planners expressed a reluctance to decrease accessions, even when endstrength was forecast to surpass its authorization. Much of this reluctance stems from the Service's memory of severe accession cuts during the military drawdown. As planners noted, some YOS cohorts still show significant experience gaps resulting from that drastic action.

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122. The National Defense Authorization Act (NDAA) allows Services to finish the fiscal year up to 3 percent above authorized endstrength but has no lower tolerance. Air Force strength planners noted that they have never finished a fiscal year above the 3-percent upper bound.

123. This also assumes that, unlike the Army, the Air Force will not get an increase in its endstrength authorization.

Importance of meeting the year-end endstrength numbers

The Air Force personnel with whom we spoke did not seem particularly concerned about exactly hitting the endstrength number at the end of the year. They referred to the Army situation in 2000: the Army was understrength and went to great lengths to try to get more accessions. The Air Force appears committed to a steady-state accession model. If accessions are to be governed by steady-state principles, the Air Force cannot increase or decrease accessions to compensate for losses that are underforecast or overforecast. The planners stated that, if the Air Force is below its required endstrength (as it was about five years ago), it submits a memo to that effect, with few ramifications. The belief that there are more important force structure concerns than meeting year-end endstrength targets also was evident in our meetings with Army strength planners.

Officer endstrength planning

Officer strength is not tracked throughout the year, since most attrition occurs during the summer (just prior to the end of the FY). Similar to the other Services, enlisted accessions are manipulated for minor adjustments to endstrength, since officer accessions are not easily modified. Unlike the Marine Corps, however, the Air Force has the option of commissioning officers directly into the Reserves. This can be used to access officers who would otherwise cause the Air Force to exceed active-duty endstrength.

Two models are used for officer inventory analysis and planning. A simulation model (ARENA) is used to determine the number of officers to promote in the near term. This model uses a 3-year historical weighted average to produce promotion numbers for a 5-year planning horizon and supports the requirement to forecast officer promotions with respect to DOPMA restrictions. A long-term sustainment Excel-based model that uses 7-year historical averages, loosely termed the Sustainment Model, develops accession targets with which to build the force looking as many as 30 years into the future.

The Air Force's governing philosophy for forecasting officer losses is that the primary driver of behavior is the Commissioned Years of

Service (CYOS) and the secondary driver is the "core" to which an officer belongs.[124] Losses by grade are ignored, under the belief that the behavior of a Captain with 15 CYOS is more similar to that of a Major with 15 CYOS than to another Captain with 5 CYOS. After accounting for CYOS, behavior is assumed to be driven by the officer's particular core (but not by the particular shredout—attempting to forecast based on shredouts is thought to induce more error than forecasting on the core).

To forecast losses in each of the models, continuation rates are developed for each grouping. The basic formula for continuation rates is:

> (the number present in a given FY with a given CYOS)/
> (the number present in the preceding FY with 1 less CYOS).

This basic formula is applied to each CYOS and core cohort to develop continuation rates.

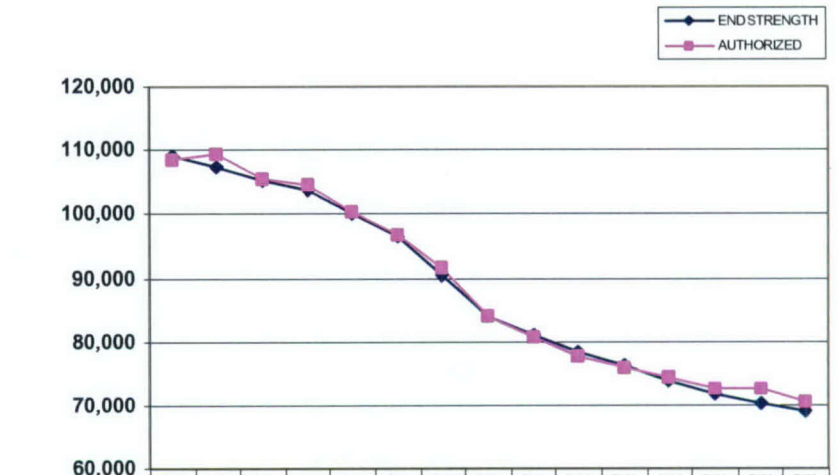
Analysis of officer inventories have shown that the inventory is more sensitive to policy than economic trends. The challenge for conducting a causal analysis is that both policy and people react to environmental changes.

Reports

The endstrength planners used to give monthly briefings to the Air Force Deputy Chief of Staff, Personnel (AF/DP). In recent months, they have suspended these briefings, but have sent status charts (updated monthly) to the Secretary of the Air Force and the Secretary of the Department of Defense. Figure 43 shows one such chart for officer endstrength.

124. The Air Force's approximately 70,000 officers are categorized by "core" (the equivalent of the Marine Corps' Occupational Field (OccFld)). Within each core are multiple "shredouts," or groupings of like MOSs. For example, all Air Force pilots belong to the 11XX core (the 11 denotes pilot, the first X denotes a pilot group (airlift, bomber, fighter, helicopter, trainer, tanker, etc.), and the second X is an experience level (1 = entry, 2 = intermediate, 3 = qualified, 4 = staff).

Figure 43. Air Force officer endstrength and authorized endstrength[a]



	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00
END STRENGTH	109048	107338	105126	103697	100045	96599	90376	84073	81003	78444	76388	73983	71892	70318	69023
AUTHORIZED	108589	109446	105538	104574	100290	96660	91766	84076	80876	77740	75928	74458	72732	72616	70616

a. Briefing from the Air Force's strength planners.

Appendix F: The endstrength management tool

Although the focus of this paper is on the data and processes that the strength planners use to forecast endstrength losses, the planners have several important duties beyond loss forecasting—including managing and reporting endstrength over the fiscal year. As such, we worked with them to develop and refine spreadsheet tools that would facilitate performance of these duties.

Enlisted endstrength management

After the planners have developed the enlisted endstrength plan, they use it to create a management workbook. Doing so automatically extracts all information needed to track the plan's performance over time (i.e., the difference between forecasted and actual losses and gains and their net effect on enlisted endstrength).

Tracking losses/gains

For a given month, say October, the planners enter the actual grade-strength and numbers by grade (as reported in the gains/loss cube) for:

- NEAS attrition (retirements and deaths tracked separately)[125]
- EAS attrition
- Reenlistments
- E-to-O losses and gains (each tracked separately)

125. Deaths and retirements are included in the aggregate NEAS numbers and also reported separately because Servicemen Group Life Insurance and Death benefits are tied to actual deaths; retirements are treated the same way because Permanent Change of Station (PCS) dollars are tied to them.

- Gains (deserter gains, EAD gains, other gains, male accessions, female accessions, continuous reenlistments, and broken reenlistments each tracked separately)
- Adjustments.

Next, the spreadsheet tool automatically generates a summary table which calculates the difference between the original forecast (from Memo 01) and the actual values for each subelement in both number and percentage terms. Table 70 presents an example for EAS losses.

Table 70. Comparing actual EAS losses to forecast losses: An example

Actual through	2190	Forecast EAS	15196	Forecast EAS	17386
Oct		(remaining)		FY	
Forecast	2282	Rate of EAS =	**96%**	Planned EAS	18111
					-725
Difference	-92				

The second column of the figure shows that, in this particular FY, the forecast number of EAS losses in October was 2,282, whereas the actual number was 2,190. The model had forecast 92 more losses than occurred; put another way, the actual number was 96 percent of the forecast (in column 4).

The spreadsheet tool also sums up all EAS loss predictions in the FY—in this case, there were 18,111 EAS losses forecast over the entire FY (column 6). The spreadsheet then applies the calculated error rate (96 percent for this 1-month example) to this total to determine a revised forecast of EAS losses for the remainder of the FY.[126] In this case, it is:

18,111*.96 = 17,386 (in column 6).

126.In a subsequent month (November), the EAS losses would be multiplied by the average error rate for the 2 months, and so on. The error rate correction only begins to have real meaning after 5 to 6 months of data.

The difference between the original EAS loss forecast for the FY (18,111) and the "new" forecast loss rate (17,386) determines anticipated differences in EAS losses at the end of the FY. In this example, the planners might report in their October briefing that they would expect to have 725 fewer EAS losses than originally predicted by the end of the FY. Adding up the differences across each subcomponent (and weighting each subelement by its "share" of the original forecast) will give the planners an "adjusted forecast," as reported by the orange line shown later in figure 44. When the adjustments are significant, a new Memo 01 is distributed to MCRC (see appendix A for an example).

Tracking promotions

The planners also track promotions and their effect on endstrength. They do this by comparing promotions predicted by the model to actual promotions (see table 71).

Table 71. Comparing promotions from the model to planned promotions

	Next month Promotions	Promotions via Model Month		Model Population	Total to Promote	NOV		Model Forcast		Forecast
Grade	Oct	Oct	Difference	NOV	NOV	Will Promote	Delta	DEC	DEC	DEC
E9	23	16	-7	15	8	18	-10	14	4	15
E8	65	66	1	57	58	63	-5	53	48	52
E7	178	151	-27	151	124	141	-17	156	139	0
E6	195	109	-86	275	189	190	-1	396	395	220

For instance, in September, the enlisted strength planners announce the number of E8 promotions previously forecast for October (65 in this example) and a forecast number of promotions for November (63). Both of these forecasts are based on the model. Following the planners' instructions, the Marine Corps promoted 65 E8s in October.

But once October ends (and actual loss and gain data are filled in), the model predicts that there should have been 66 E8 promotions in October (a revision of its previous prediction). The difference between the number promoted and the number the model now says

should have been promoted (66 - 65 = 1) can be added to November's revised model estimate (57) to determine the total number of E8 Marines that can be promoted in November (58).

But the enlisted strength planners do not want to "break the faith"—in other words, they originally had announced 63 E8 promotions for November, so to promote only 58 would seem like a broken promise. Thus, the planners go ahead and promote 63 in November—knowing that this implies that they "overpromoted" by 5 in November.[127]

Now the enlisted strength planners must announce how many promotions can be made in December. The model predicts 53 E8 promotions in December and they add the carryover number from November (-5) to get 48. The planners use their judgment to promote at, below, or above this number. In this example, the planners opted to promote an additional 4 Marines, or 52 E8s, in December.[128]

Tracking accessions

The enlisted strength planners also track accessions (see table 72). They must ensure that MCRC does not overship more than 150 to 180 recruits in a fiscal year.

The second column of the figure reports the number of non-prior service accessions that MCRC reportedly shipped in a particular month (2,973 for October in this example). Adding in the number of prior-service accessions for October (2), the total number of recruits the MCRC reportedly shipped was 2,975 in this example.

According to the TFDW (and, consequently, the gains/loss cube) 3,429 recruits posted in October. Adding in the one continuous/broken service reenlistment in October, the TFDW data report that 3,250 recruits posted in October. Taking the difference between the number shipped (according to MCRC) and the number shipped

127.EPS's policy is to promote the forecast number almost without exception and to carry over any difference to the next forecasted month.

128.This may be as much art as science. For example, the planners may feel that more Marines will leave the Corps in December, so that losses will be higher than forecast.

(according to TFDW) yields 275 for October (in column 8). These "extra" accessions posted to the TFDW are a combination of carry-over accessions from the previous fiscal year and/or overshipping.

Table 72. Tracking enlisted accessions

1	2	3	4	5	6	7	8
Shipping Month	MCRC REG NPS	Prior Service	Total	TFDW	Cont/ Brok	Total	Not Posted
OCT	2973	2	2975	3249	1	3250	275
NOV			0			0	0
DEC			0			0	0
JAN			0			0	0
FEB			0			0	0
MAR			0			0	0
APR			0			0	0
MAY			0			0	0
JUN			0			0	0
JUL			0			0	0
AUG			0			0	0
SEP			0			0	0
Total		2	2975	3249	1	3250	

Table 73 shows the accession plan that the planners had originally developed. Comparing the number MCRC shipped to the plan, we see that, in this example, MCRC "overshipped" 2,975 - 2,839 = 136 recruits. Adding these two numbers (136 + 275 = 411) tells the planners that they had 411 more accessions than originally planned.

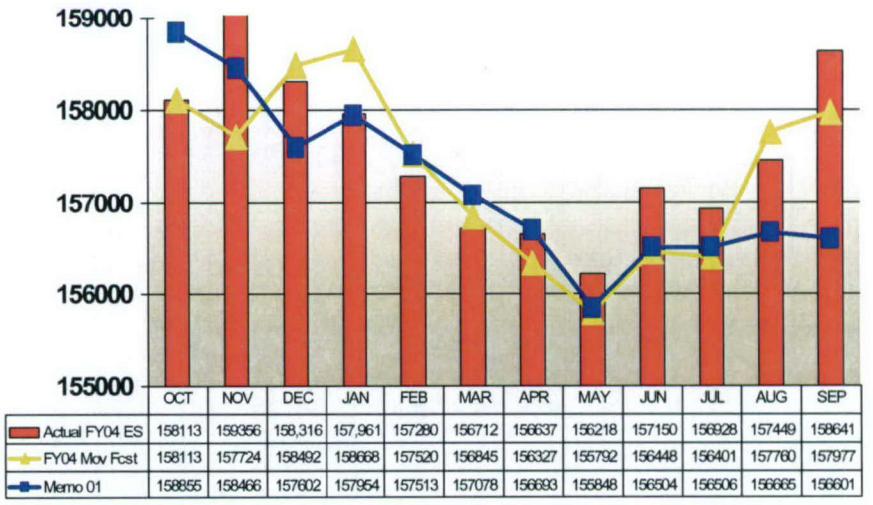
Endstrength reporting

Each month, the enlisted strength planners prepare an endstrength briefing for the Deputy Commandant, Manpower and Reserve Affairs. Figure 44 shows the summary slide from the October 2004 enlisted endstrength briefing. The red bars show actual strength numbers, the blue line shows the execution plan (Memo 01), and the orange line shows the FY04 moving forecast. The endstrength planners finished FY04 with an enlisted endstrength of 158,641, or 2,040

Table 73. Comparing plan accessions to those that actually shipped

Month	Male	Female	Total	Over Shipping
OCT	2668	171	2839	136
NOV	2205	127	2332	
DEC	2446	160	2606	
JAN	2598	205	2803	
FEB	1900	153	2053	
MAR	1874	226	2100	
APR	1585	152	1737	
MAY	1400	90	1490	
JUN	4125	269	4394	
JUL	4158	229	4387	
AUG	4062	264	4326	
SEP	2991	239	3230	

Figure 44. Active-duty enlisted endstrength, FY04[a]



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Actual FY04 ES	158113	159356	158,316	157,961	157280	156712	156637	156218	157150	156928	157449	158641
FY04 Mov Fcst	158113	157724	158492	158668	157520	156845	156327	155792	156448	156401	157760	157977
Memo 01	158855	158466	157602	157954	157513	157078	156693	155848	156504	156506	156665	156601

a. Briefing from the Enlisted Strength planners.

Marines above the target. If the country were not engaged in a war, this would have been a problem.[129]

Officer endstrength management

Tracking losses/gains

Like the enlisted planners, the OIP must track actual gains and losses in the execution year and compare them to his forecasts. The OIP maintains two parallel loss tables in his execution year plan that he uses to compare his original FY plan (First cut or Memo 01) with actual losses that occur throughout the year (Final cut). Throughout the execution year, he records actual losses as they become available, and modifies corresponding planned losses in the Final cut table, or management tool. His spreadsheet tool automatically calculates the difference between the original losses forecast by grade (from Memo 01) and actual losses (see table 74).[130] The OIP also calculates a monthly error rate.

The OIP updates the forecast based on actual losses and gains, other new information (for example, a policy change), and updated retirement, resignation, separation, and discharge data.[131] Unlike on the enlisted side, the planner's updated forecast is more like a scorecard (and less like a decision tool) since the OIP does not typically revise MCRC's recruiting guidance due to the long lag of officer accessions.

In addition, the OIP has developed a spreadsheet tool to help him run quick "what if" endstrength simulations. This tool (see figure 45) allows him to vary the annual officer attrition rate (between 5 percent and 10 percent) and determine how losses (and endstrength) in the execution year and the out-years would be affected.

129.Congress is likely to provide supplemental funding for the war effort.

130.Execution numbers are notional because it is still too early for execution data.

131.The OIP gets weekly updates as these data (e.g., requests for separation) get entered into the system and are approved.

Table 74. Tracking officer losses in the execution year[a]

	OCT	NOV	DEC	JAN
GEN	3	0	0	3
COL	12	5	6	9
LTCOL	34	9	10	11
MAJ	40	14	12	24
CAPT	51	53	34	40
1LT	59	7	22	35
2LT	5	7	2	2
CWO5	4	0	1	1
CWO4	9	2	3	4
CWO3	11	4	4	6
CWO2	1	1	2	1
WO1	2	7	0	0
Total Plan	231	109	96	136
execution	211	115	96	140
DELTA	-20	6	0	4

a. From the OIP's spreadsheet model.

Figure 45. Officer endstrength simulation tool (with 10 percent annual attrition rate)[a]

COA 1/150

	B/S	Gains	Losses	E/S	% Attrition	MYA
FY04	18746	1700	1717	18729	0.0916	18785
FY05	18729	1716	1873	18572	0.1000	18628
FY06	18572	1716	1857	18431	0.1000	18486
FY07	18431	1716	1843	18304	0.1000	18359
FY08	18304	1716	1830	18189	0.1000	18244
FY09	18189	1716	1819	18086	0.1000	18141
FY10	18086	1716	1809	17994	0.1000	18048
FY11	17994	1716	1799	17910	0.1000	17964

Goal: 19100
Max Gain: 1768

Annual Attrition Rate
(Range 5% - 10%)

FY05	10.00%
FY06 and up	10.00%

a. From the OIP's spreadsheet model.

Figure 46 shows losses and endstrength totals if the annual attrition rate were 10 percent for all future FYs (FY05–11). The planner can vary this rate, which changes loss and endstrength counts accordingly. For example, in figure 46, we change the annual attrition rates to 7 percent. We see that the number of forecast officer losses in any given FY (FY05, for example) falls (from 1,873 to 1,311) as a result of this

lower attrition rate. Consequently, forecast officer endstrength is higher (it goes from 18,572 to 19,134 in FY05), which changes the beginning strength of the next fiscal year (FY06).

Figure 46. Officer endstrength simulation tool (with 7 percent annual attrition rate)[a]

COA 1/150

	B/S	Gains	Losses	E/S	% Attrition	MYA
FY04	18746	1700	1717	18729	0.0916	18785
FY05	18729	1716	1311	19134	0.0700	19191
FY06	19134	1716	1339	19511	0.0700	19569
FY07	19511	1716	1366	19861	0.0700	19920
FY08	19861	1716	1390	20187	0.0700	20247
FY09	20187	1716	1413	20490	0.0700	20551
FY10	20490	1716	1434	20771	0.0700	20834
FY11	20771	1716	1454	21033	0.0700	21096

Goal: 19100
Max Gain: 1768

	Annual Attrition Rate (Range 5% - 10%)
FY05	7.00%
FY06 and up	7.00%

a. From the OIP's spreadsheet model.

Tracking promotions

Officer promotions are based on forecasted losses. Because DOPMA tightly constrains the number of Colonels through Majors that the Marine Corps is allowed to have, the OIP promotes to that "ceiling" as losses are actualized and vacancies become available.

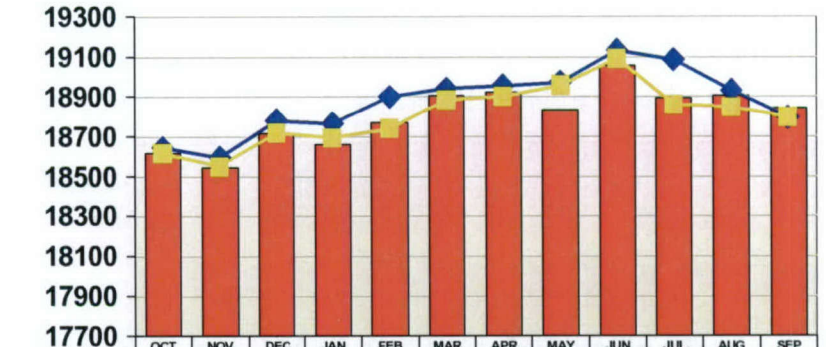
Tracking accessions

The OIP closely tracks officer accessions. MCRC may not access more than 2 percent above or 0.5 percent below the target mission number. The OIP speaks to MCRC on a daily to weekly basis to monitor progress toward the goal over the course of the FY.

Endstrength reporting

Like the enlisted endstrength planners, the OIP prepares an endstrength briefing each month for the Deputy Commandant, Manpower and Reserve Affairs. Figure 47 shows the summary slide from the October 2004 officer endstrength briefing.

Figure 47. Active-duty officer endstrength, FY04[a]



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Actual FY04 ES	18618	18542	18714	18658	18772	18904	18920	18830	19052	18895	18904	18839
FY04 Forecast	18646	18594	18780	18766	18901	18938	18956	18972	19131	19085	18931	18798
Updated F/C	18618	18550	18720	18693	18738	18882	18900	18953	19089	18859	18849	18797

End FY actuals were 41 above Memo-01 forecast.

(Minus F/C'd 174 MOB and 46 Retire/Retain AC E/S is 18,619)

a. Briefing from the Officer Strength planner.

Appendix G: Weighting historical data

Throughout the forecasting processes, the endstrength planners weight historical data to develop their execution year predictions. The weights the planners use can vary—for example, they might use 4 years of historical data weighted evenly or 3 years of data with the most recent year weighted more heavily.

Allowing the planners to determine weights for historical data has advantages and disadvantages. The advantage is flexibility. If planners they believe (based on their knowledge and expertise) that the most recent year was an anomaly, they can give it less weight in the average. (Indeed, good forecasts are a combination of art and science.) The disadvantage, however, is that planners might hesitate to set these weights—particularly if they are inexperienced or have no good hunches and/or information about losses in the forecast year.

Recognizing the possible need for guidance, we have developed a few tools that planners may use to help them determine weights for an upcoming year. The first is a "significant events" database.

"Significant events" database

Table 75 shows significant events and characteristics of recent fiscal years (FY88–04).

Table 75. Significant events: Documenting yearly events for TFDW years

Fiscal year	Unemployment rates: Overall	Unemployment rates: Male 25-34 yrs	Military/ civilian pay ratio	Aviation Continuation Pay	Fiscal year characteristics
1988	5.5	5.4	0.993		TFDW data is incomplete and should not be used.
1989	5.3	4.9	0.994		
1990	5.6	5.2	1.001		Buildup to the Gulf War skews data.
1991	6.8	6.7	1.057		Gulf War skews data. Because stop-loss was used, EAS losses are skewed. NEAS losses are lower due to the war's impact (less misbehavior during wartime). There were 450 mandatory retirements.
1992	7.5	7.8	1.063		This is the beginning of a severe drawdown, which skews all loss data. There were 717 VSI/SSB[a] separations and 380 mandatory retirements. Economic recovery begins.
1993	6.9	7.2	1.077		Drawdown continues, with the same impact as in 1992. There were 1,182 VSI/SSB separations and 320 mandatory retirements.
1994	6.1	6.2	1.094		Residual drawdown effects in data. There were 506 VSI/SSB separations and 644 mandatory retirements.
1995	5.6	5.2	1.103		
1996	5.4	5.0	1.091	**S/T:** $6,000 for FW, RW, and NFO; **L/T:** 0[b]	
1997	4.9	4.4	1.090	**S/T and L/T:** $12,000 for FW, RW, and NFO	
1998	4.5	3.9	1.071	**S/T and L/T:** $12,000 for FW, RW, and NFO	The economic recovery, which began in 1992, picks up steam. The economy is very robust, which may skew data.
1999	4.2	3.7	1.042	**S/T and L/T:** $12,000 for FW, RW, and NFO	Red-hot economy, which may skew data—especially volunteer separations (retirements, EAS losses, etc.). Many Marines have 17 Apr 1999 as their date of PMOS attainment (the date a Marine became PMOS qualified). This date is invalid for calculations of training time before Oct 2000.
2000	4.0	3.4	1.063	**S/T:** $18,000 FW, $9,000 RW, and $6,000 NFO; **L/T:** 0	This is the height of the economic expansion that began in 1992. Date of PMOS attainment is valid from this point on.

Table 75. Significant events: Documenting yearly events for TFDW years (continued)

Fiscal year	Unemployment rates: Overall	Unemployment rates: Male 25-34 yrs	Military/ civilian pay ratio	Aviation Continuation Pay	Fiscal year characteristics
2001	4.7	3.9	1.097	**S/T:** $18,000 FW, $9,000 RW, and $6,000 NFO; **L/T:** $25,000 FW, $12,000 for RW and NFO	First year that SRBs are paid lump-sum. Ran out of SRB money in Mar 2001 and stopped making payments. Started offering a full 48 months of additional obligated service, meaning that USMC will get 8 years out of two contracts vice about 7.3. This will, in time, move the bulk of career force EASs from Oct- Dec to JJAS. 9/11 happened, but had a minimal effect on the data.
2002	5.8	5.6	1.150	**S/T:** $18,000 FW, $9,000 RW, and $6,000 NFO; **L/T:** $25,000 FW, $12,000 for RW and NFO	First year of STAP and frontloaded Zone B and C SRB money. War in Afghanistan had minimal effect on the data. There was limited use of stop-loss, which had little to no effect on the data. Endstrength increased by 2,400.
2003	6.0	6.2	1.235	**S/T:** $18,000 FW, and $6,000 RW and NFO; **L/T:** $25,000 FW, $12,000 for RW and NFO	Iraq War and Corps-wide stop-loss. Data, especially loss data, severely skewed by these events. Strength numbers also skewed. Though inventory of Marines was over the requirement, promotions were not affected since stop-loss Marines were treated as eventual losses. Number of Marines with 300 or more days PERSTEMPO averaged 3,862 for 1st qtr, 8,557 for 2nd qtr, 14,481for 3rd qtr, and 14,828 for 4th qtr.[c]
2004	5.5	5.7	1.215	**S/T:** $18,000 FW, $3,000 RW and NFO; **L/T:** $25,000 FW, $17,000 for RW and NFO	Significant increase in operational tempo and occupation duty in Iraq affects reenlistment and loss data and strength numbers. Authorized cross-FY extensions for first-termers will increase the FTAP-eligible EAS population for FY05. Total number of Marines with 300 or more days PERSTEMPO averaged 14,453 in 1st qtr, 13,202 in 2nd qtr, and 15,224 in 3rd qtr.

a. These were voluntary separation incentives. VSI was an annuity and SSB was a lump sum; Marines could choose between these incentives.

b. S/T is short term (12-36 months), L/T is long term (more than 36 months), FW is fixed wing, RW is rotary wing, and NFO is Navy flight officer.

c. Although the Marine Corps has tracked PERSTEMPO since FY02, it is only in FY03 that there is enough accumulated data to show trends. The 300 days are over the past 2 years.

Optimization tool

The second is an optimization tool based on a methodology that the enlisted Air Force endstrength planners currently use to determine weights for historical data. The optimizer answers the question: what weightings of historical data would have most closely predicted last year's actual counts? Because we know last year's actual losses, we can solve for weights, which—when multiplied by the three preceding years' losses—would have most closely estimated last year's losses.[132] If we do this over a number of years, we can get an average of the weights to use to predict the next year's actual losses.

We illustrate this by deriving a historical weighting scheme to estimate FY04 category losses based on the historical loss data shown in figure 48.

Figure 48. An example: Using Excel's Solver to determine weights for category losses

		Weights for year							Category Loss
Year	Category Losses	1999	2000	2001	2002	2003	Average		Predictions
1996	731	0.014							
1997	757	0.041	0.203						
1998	713	0.962	0.352	0.222					
1999	727		0.424	0.354	0.138				727
2000	713			0.420	0.300	0.170			713
2001	715				0.375	0.292	0.149		715
2002	582					0.360	0.268		582
2003	539						0.508		539
2004	**536**								536
Let d1, d2, and d3 equal the weights									
Rules: d1+ d2+ d3 - 1 = 0									
d1*Yr1+ d2*Yr2+ d3*Yr3 - (Yr to predict) = 0									
(To write these 2 equations as 1 equation, add the 2 equations)									
Subject to d1 >= 0, d2 >= d1, d3 >= d2									

132. The set of weights is not unique. We have experimented with the solver and have taken the last set of weights given by the program.

First, we use Excel's Solver to determine the values for a set of weights (d1, d2, and d3) that most closely approximates 1999 category losses. For example: 0.014*731 +.041*757 + .962*713 equals the 727 category losses for 1999 and .203*757 + .352*713 + .424*727 equals the 713 category losses for 2000. We run the solver for weights to predict category losses for all years from 1999 to 2003 (see figure 48).[133]

We then average the weights that we have obtained for each of the previous years. In our example, the average weight for d1 is 0.149, 0.268 for d2, and 0.508 for d3. Thus, our 2004 category loss estimate of 536 is the sum of those weights multiplied by actual category losses for 2001, 2002, and 2003.

Although there is no guarantee that these weights will be the right ones for correctly predicting the next year, this tool may give planners a "first cut" at setting weights. It should be straightforward to incorporate the optimizer program into the enlisted and officer endstrength models.

Exponential smoothing

Exponential smoothing is another method of forecasting based on historical data. It assigns exponentially decreasing weights to observations as they get older—that is, recent observations are given relatively more weight than older observations. If we believe, for example, that retirements this year will be most similar to the level observed in the most recent prior year, exponential smoothing could be more appropriate for forecasting retirements than a simple weighted average of historical data.

In the simple exponential smoothing (SES) model, if m denotes a "smoothing constant" (between 0 and 1) and S(t) denotes the value of the smoothed series at period t, then:

$$S(t) = mY(t) + (1-m)\ S(t-1)$$

can be used recursively to update the smoothed series as new observations are recorded.[134]

133.Figure 48 has the rules and the constraints that we used in the solver.

134.http://www.duke.edu/~rnau/411avg.htm.

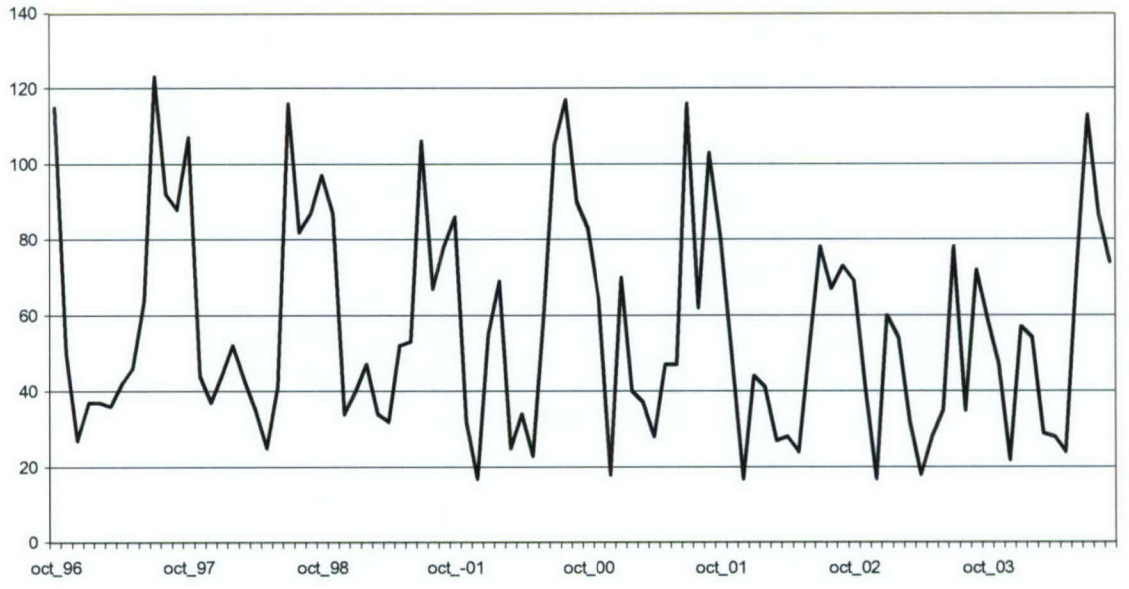
Then, the next period's forecast is simply the current smoothed value:

$\acute{Y}(t+1) = S(t)$, or

$\acute{Y}(t+1) = mY(t) + (1\text{-}m)\acute{Y}(t)$.

Exponential smoothing can be modified (a) to include seasonality factors, (b) to account for short-term and regular seasonal variation in the data, or (c) to include a trend that accounts for long-term movement in the data. For example, officer retirements show a definite seasonality—peaking during the summer months (see figure 49). We could forecast these retirements using exponential smoothing with seasonality factors. Figure 50 shows FY97–05 actual retirements (blue) plotted against the OIP's forecasts (red) and the exponentially smoothed forecast (green).

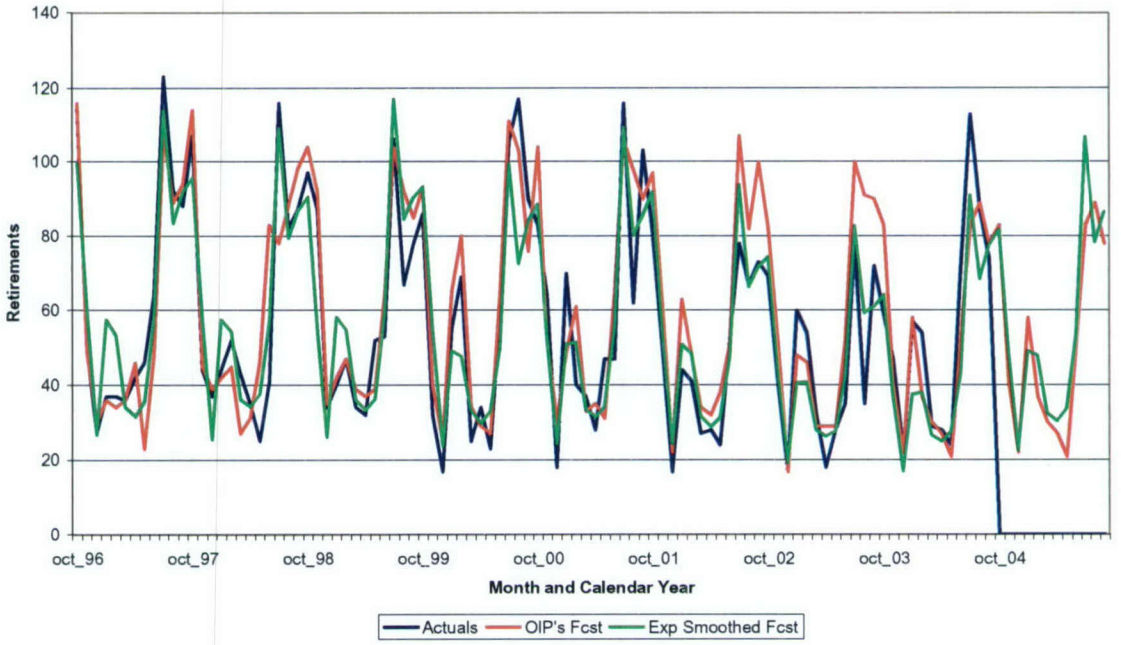
Figure 49. Number of officer retirements FY97–04



Exponential smoothing using seasonality and/or trend factors is easily done with Insight.xla business analysis software for Microsoft

Excel. The software allows the selection of warm-up and forecasting periods and adjustment of parameters.

Figure 50. Retirements: Actuals, OIP and exponential smoothing forecasts, FY97–05



The advantage of this process over the current weighting process is that it weights the most recent year's data most heavily, with exponentially decreasing weight given to older observations. It also allows the OIP to account for seasonality and/or trends in the data.

Appendix H: Constructing an NEAS continuation rate and its associated problems

We attempted to construct an NEAS continuation rate for Marines who had completed 1 to 18 years of service. We believed that using continuation rates to forecast NEAS losses would be preferable to the current method for two reasons:

1. NEAS continuation rates vary systematically by years of service.[135]
2. Populations in different years of service vary over time.

For these reasons, we believed that using historical averages of NEAS losses might miss some important variation.

Populations in different years of service vary over time because of year-to-year fluctuations in the size of accession cohorts. As figure 51 shows, the accession mission (and, consequently, the size of accession cohorts) varies considerably over time.

Another advantage of estimating NEAS continuation rates in this way would have been that it is the perfect complement to the way that EAS attrition is forecast. Using EAS continuation rates for those in the career force and NEAS continuation rates for others would have ensured that we had accounted for the continuation and loss behavior of all Marines in those years-of-service groups.[136]

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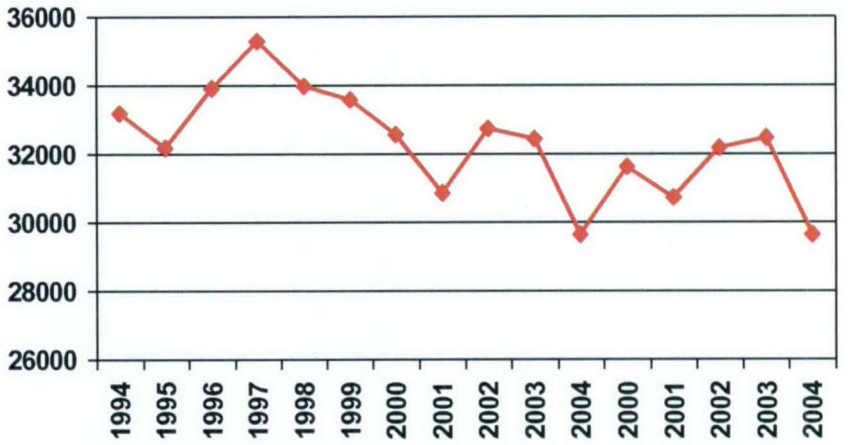
135. For example, those in their 17th year of service are less likely to attrite because retirement is looming on the horizon; those in the 2nd year of service might attrite at a fairly high rate.

136. Those in the first year of service and those in the retirement-eligible population would have been addressed separately.

Figure 51. Non-prior enlisted accession mission



To calculate NEAS continuation rates (the complement of which are NEAS separation rates), we first had to identify the population of interest. Unlike in the EAS continuation rate calculation (which excludes first-term Marines whose continuation rates are addressed in the FTAP), here we wanted to include all Marines at all YOS levels beyond the first year of service and below 18 YOS.

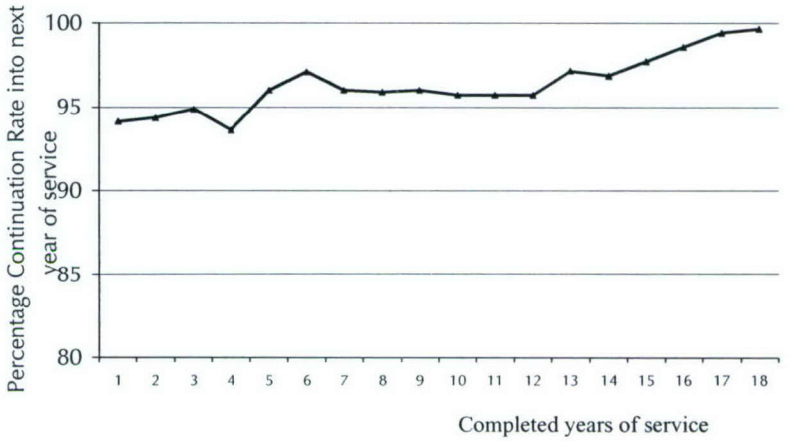
To calculate the NEAS continuation rate for a particular FY (say, FY03), we had to identify:

- Those Marines at the beginning of FY03 who did not have an EAS of FY02
- All Marines present at the end of FY03, irrespective of EAS date.

We then matched the begin-year population (Begin year pop) to the population of all Marines at the end of the FY. We called those who matched "Stayers." Using this methodology, the NEAS continuation rate for FY03 was:

= Stayers/Beg year pop (see figure 52).

Figure 52. NEAS continuation rates for Marines who have completed 1 to 18 years of service: FY02–03 average



To obtain the NEAS loss rate for a particular FY and YOS, we computed 1 minus the continuation rate. We then multiplied the NEAS loss rate by the NEAS population in that FY and YOS to determine yearly NEAS losses by YOS.

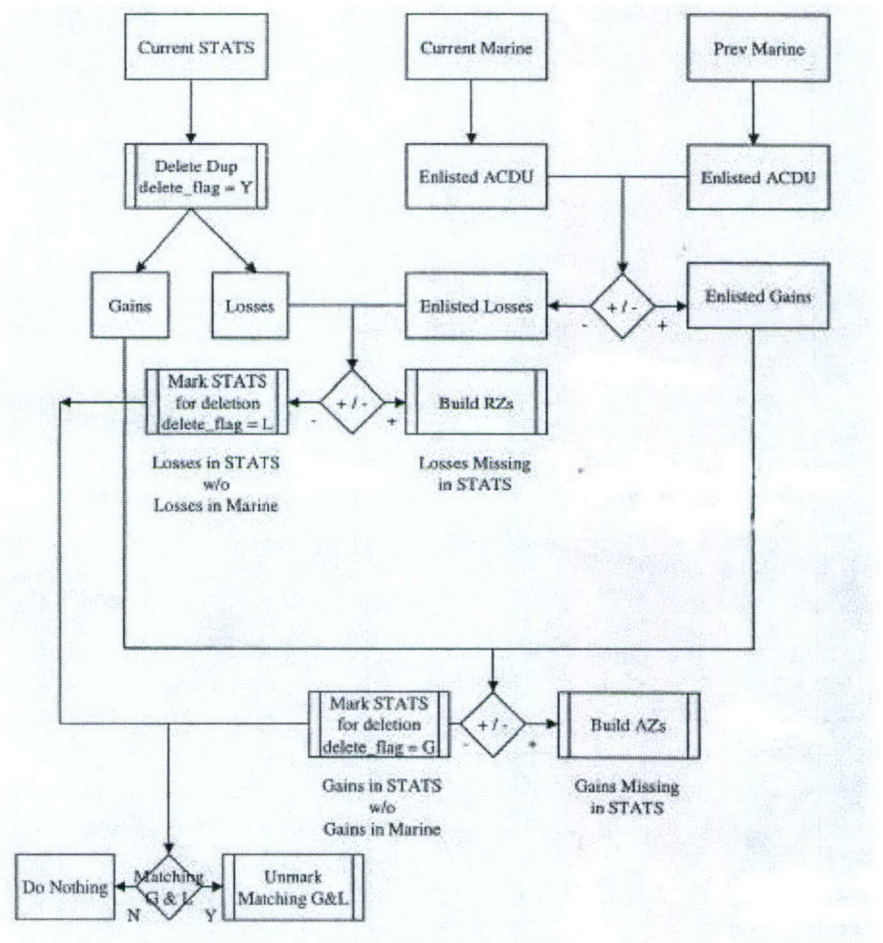
Unfortunately, desertions and returns from desertions complicate this analysis. Let's suppose, for example, that there was a particular Marine (not in his EAS year) who deserted four times in FY03 but was there at both the beginning and end of the FY. This methodology would not capture his desertions. Even using monthly begin and end counts might miss them if the Marine deserted at the middle of the month.

For these reasons, we decided that constructing an NEAS continuation rate was too problematic.

Appendix I: Data issues

Before becoming part of the data cubes, transaction data must be cleansed to ensure their validity. Figure 53 outlines the data cleansing process that SAIC currently uses.

Figure 53. Data flow for enlisted data cleansing[a]



a. From SAIC.

Identification of suspicious transactions

The strength planners rely on getting accurate gain and loss information. If losses and gains are not reported or are duplicate, the strength planners will have erroneous information.

Over the course of our analysis, we investigated losses in the first year of service, intending to identify a better—or at least alternative—way of forecasting these losses. We obtained individual loss and gain information for Marines in their first 364 days of service for recent years. These loss/gain records were supposed to be ones that had been cleansed and had been identified as valid transactions.

We then sorted these individual records by SSN to look at desertion and return from desertion patterns. (The process that cleanses the data does not look at individual records sequentially to establish validity.)[137]

Looking at the individual records in sequential order, we identified several erroneous (or at least suspicious) transactions.[138] Examples included:

- Duplicate (or nearly duplicate) transactions
- Loss/gain transaction sequences that did not make sense
- Correction of erroneous gain, where no erroneous gain was previously recorded.

Table 76 highlights several examples.

Example 1

Rows 1 through 3 represent transactions for an individual Marine (ID #2646). According to the data, the Marine accessed (A0) in Seq #90

137.The erroneous or suspicious transactions that we identified, however, probably should have been identified and fixed in the Manpower Information Division *before* processing in the TFDW.

138.As previously noted, we only investigated transactions for those in the first 364 days of service.

(row 1), was dropped to desertion status (R4) in Seq #100 (row 2), and was posted as a implied loss (RZ) in Seq #111 (row 3).[139]

Table 76. Examples of suspicious transaction series

Row #	ID #	Seq #	Type Change Code	Sep Code
1	2646	90	A0	
2	2646	100	R4	PKF1
3	2646	111	RZ	9611
4	3101	87	A0	
5	3101	92	R4	PKF1
6	3101	95	A7	0000
7	3101	95	A7	0000

There are a couple of problems with this sequence of transactions. First, a Marine should not be counted as a loss twice consecutively without counting as a gain in between. This means that either (1) there should have been an A7 (return from desertion status) posted between the two loss transactions, or (2) the implied loss transaction is incorrect. The end result is that there is one more loss than there should be in the numbers produced for the strength planners.

Example 2

Rows 4 through 7 represent transactions for another individual Marine (ID #2646). According to the data, the Marine accessed in Seq #87 (row 4), was dropped to desertion status in Seq #92 (row 5), and was posted as a return from desertion twice in Seq #95 (rows 6 and 7).

This sequence of transactions also has several problems. First, a Marine cannot return twice consecutively from deserter status. Either (1) there should have been another desertion (R4) transaction between the two R7 transactions, or (2) the second R7 transaction is

139.Each sequence number refers to a particular FY and month. All desertions are losses and all returns from desertion are gains.

a duplicate. It is probably the latter since both return from desertion gains occur in the same fiscal year and month (identical sequence numbers).[140]

Net effect of suspicious transactions

After identifying Marines with suspicious transaction patterns (those with two or more consecutive loss or gain transactions), we also wanted to determine how much of an overall effect these erroneous transactions were likely to have on endstrength. If the errors in gains and losses were roughly equal, their net effect may have been small.

Table 77 shows the net difference between the number of suspect separations and gains. For example, of the 12,254 transactions that took place in FY87, there were 70 gain (A) records that were suspicious (gains occurred consecutively two or more times). In that same FY, there were 38 suspicious loss (R) records (losses occurred consecutively two or more times). The net effect of these errors was 32 (70 - 38 = 32).

As the table shows, the net effect can be quite small (only 6 in FY92) or quite large (2,381 in FY98) in a given FY. Over the entire period, we see that there were about twice as many suspicious gains as there were suspicious losses, with a net effect of about 6,500.

Although historically suspicious gains and losses have somewhat offset each other, there is no guarantee that this will continue in the future. Thus, it is important to try to eliminate double gains (two gains for the same Marine without an intervening loss) and double losses (two losses for the same Marine without an intervening gain).

140. Typically, a Marine must be in UA status for 30 days before he or she will be categorized as a deserter, but a commander may put a Marine in deserter status sooner if he or she sees fit.

Table 77. Net effect of suspicious transactions

End FY[a]	Total Transactions	Suspect transactions Gains[b]	Losses	Net (Gains - Losses)
1987	12,254	70	38	32
1988	40,542	253	184	69
1989	39,979	238	229	9
1990	38,274	533	362	171
1991	39,499	316	252	64
1992	41,653	227	221	6
1993	39,059	196	167	29
1994	40,514	282	334	-52
1995	40,838	229	207	22
1996	42,061	472	277	195
1997	43,313	969	473	496
1998	43,162	3,812	1,431	2,381
1999	41,207	2,636	872	1,764
2000	39,966	2,667	1,476	1,191
2001	40,090	1,375	861	514
2002	40,170	79	306	-227
2003	18,825	28	118	-90
Total	**641,406**	**14,382**	**7,808**	**6,574**

a. September 30th of each year.
b. Gains are type transaction codes that begin with an A. Losses are type transaction codes that begin with an R.

Suggested changes to the data entry process

Correcting problems in the data after they have been collected can be difficult since, in many instances, it is hard to determine exactly what type of entry mistake occurred. Although SAIC may be able to modify its data cleansing code to identify suspicious patterns and make corrections based on a set of decision rules, the best solution is to ensure that entry mistakes do not occur in the first place. For example, the data entry system could be modified so that it does not "accept" two consecutive loss transactions without a gain transaction in between. This fix would require the support of the Management Information Division of Manpower and Reserve Affairs.

We also recommend adding a code for those on appellate leave (these Marines are not counted for endstrength purposes). In the current system, these Marines "disappear" from the rolls and receive an implied loss (RZ) code.

Finally, we recommend that the Marine Corps track mobilized reservists who count toward endstrength (KMs) separately.[141] These individuals started showing up in the "other gains" data in March 2002.

Changes in the data over time

We also discovered that the gains/losses cube data change over time. Since the database is still being refined, a certain amount of change would be expected as data are cleansed and procedures are changed. Still, the differences are fairly large for several fiscal years.

The Marine Corps uses Cognos, a business intelligence software, for the TFDW. Impromptu reports are queries into this database. The monthly PowerPlay gain/loss cube, with counts of categories of Marines and their gains and losses, is built from an Impromptu report. We requested the Impromptu report for Marines with less than 1 year of service by individual SSN to examine deserter data. Because of the timing of our requests, we ended up with the gain/loss cube for March 2004 and the SSN-based gain/loss Impromptu report for April 2004. Although we had no reason to anticipate that the historical data would be different, we found that they were.

Table 78 compares data from the April 2004 SSN-based Impromptu report[142] (which are supposed to be the basis for gains/loss cube counts) with those reported in the March 2004 gains/loss cube for the enlisted population in YOS = 0.

Although the data for FY03 and FY04 look very similar and the data between FY88 and FY98 show only small differences, there are large differences in these two month-apart data pulls for FY99 through FY02. In fact, the difference in the number of gain and loss

141.Those who are activated for 2 years plus 180 days.

142.The Impromptu report had 641,406 records (with 522,076 SSNs).

transactions in the two pulls is 1,218 in FY01! Since historical data are used to establish gain and loss forecasts, these data should be examined further to determine the cause of these discrepancies.

Table 78. Differences between the March 2004 cube counts and an April 2004 Impromptu report for enlisted Marines with less than 1 year of service

		March 2004 Gain/loss cube			April 2004 Impromptu Report[b]	
TFDW[a]	Date	Loss	Gain	Total	Total	Difference
1	FY1988	1,324	10,930	12,254	12,254	0
5	FY1989	6,236	34,306	40,542	40,542	0
9	FY1990	6,769	33,210	39,979	39,979	0
13	FY1991	7,872	30,399	38,271	38,274	-3
17	FY1992	6,385	33,110	39,495	39,499	-4
21	FY1993	6,705	34,938	41,643	41,653	-10
25	FY1994	6,319	32,740	39,059	39,059	0
29	FY1995	6,768	33,744	40,512	40,514	-2
33	FY1996	6,477	34,356	40,833	40,838	-5
37	FY1997	6,686	35,334	42,020	42,061	-41
49	FY1998	8,096	35,142	43,238	43,313	-75
61	FY1999	7,177	35,768	42,945	43,162	-217
73	FY2000	6,795	33,608	40,403	41,207	-804
74	2000/Oct	528	2,906	3,434	3,494	-60
75	2000/Nov	556	1,700	2,256	2,314	-58
76	2000/Dec	653	1,770	2,423	2,882	-459
77	2001/Jan	375	3,171	3,546	3,589	-43
78	2001/Feb	557	1,597	2,154	2,249	-95
79	2001/Mar	538	2,160	2,698	2,810	-112
80	2001/Apr	559	1,742	2,301	2,387	-86
81	2001/May	411	1,323	1,734	1,767	-33
82	2001/Jun	447	4,897	5,344	5,413	-69
83	2001/Jul	505	3,251	3,756	3,855	-99
84	2001/Aug	843	4,272	5,115	5,180	-65
85	2001/Sep	575	3,412	3,987	4,026	-39
	FY2001	**6,547**	**32,202**	**38,748**	**39,966**	**-1,218**
86	2001/Oct	515	2,775	3,290	3,326	-36
87	2001/Nov	554	2,392	2,946	2,969	-23
88	2001/Dec	647	2,918	3,565	3,605	-40
89	2002/Jan	547	2,357	2,904	2,975	-71

Table 78. Differences between the March 2004 cube counts and an April 2004 Impromptu report for enlisted Marines with less than 1 year of service (continued)

TFDW[a]	Date	March 2004 Gain/loss cube			April 2004 Impromptu Report[b]	Difference
		Loss	Gain	Total	Total	
90	2002/Feb	462	2,182	2,644	2,699	-55
91	2002/Mar	568	2,056	2,624	2,682	-58
92	2002/Apr	665	1,697	2,362	2,427	-65
93	2002/May	435	1,361	1,796	1,862	-66
94	2002/Jun	355	3,814	4,169	4,233	-64
95	2002/Jul	603	4,337	4,940	4,994	-54
96	2002/Aug	755	4,224	4,979	5,165	-186
97	2002/Sep	586	2,567	3,153	3,153	0
	FY 2002	**6,692**	**32,680**	**39,372**	**40,090**	**-718**
98	2002/Oct	598	3,448	4,046	4,046	0
99	2002/Nov	470	3,101	3,571	3,572	-1
100	2002/Dec	513	1,736	2,249	2,249	0
101	2003/Jan	555	2,544	3,099	3,119	-20
102	2003/Feb	555	1,713	2,268	2,269	-1
103	2003/Mar	584	2,115	2,699	2,699	0
104	2003/Apr	463	1,567	2,030	2,031	-1
105	2003/May	416	1,499	1,915	1,915	0
106	2003/Jun	443	4,370	4,813	4,813	0
107	2003/Jul	485	3,468	3,953	3,953	0
108	2003/Aug	493	4,162	4,655	4,656	-1
109	2003/Sep	438	4,410	4,848	4,848	0
	FY2003	**6,013**	**34,133**	**40,146**	**40,170**	**-24**
110	2003/Oct	456	1,880	2,336	2,336	0
111	2003/Nov	386	3,355	3,741	3,741	0
112	2003/Dec	546	1,766	2,312	2,312	0
113	2004/Jan	353	2,358	2,711	2,711	0
114	2004/Feb	483	1,631	2,114	2,114	0
115	2004/Mar	642	1,591	2,233	2,233	0

a. This is the TFDW sequence number.

b. This April 2004 Impromptu report was supposed to be identical to the extraction that produced the April 2004 cube. Unlike the cube, however, it included SSN information.

Appendix J: The process checklist

Working with the enlisted endstrength planners, we developed a process checklist (with source data references and notes) to assist the planners as they develop the enlisted plan. This checklist provides a "recipe" of sorts for the enlisted endstrength planning process. Table 79 shows the current process checklist.

Table 79. Process checklist with source data and reference notes

Process	Data source	Source	Notes
Be sure to check the precision as displayed			
Correct grade distribution		OPS/EPS	
Correct beginning strength	ES cube	FY01 ES	Previous year ES=plan year BS
Fill in FY data sheets			
NEAS model (Recruit losses)			
Recruit phasing (Confirm phasing 31/21/48)	G/L cube	Recruit phasing	Get male and female
Continuous & broken reenlistments included in MCRC mission			CONFIRM
Recruit attrition	G/L cube	Recruit attrition	Get attrition by sex--toggle recruits
Update historical monthly recruit shipping	G/L cube	Recruit phasing	Pull 3-4 years of data and compute rates
Determine historical E3-E9 accession mix, by month, & sex	G/L cube	Recruit grade spread	Pull "A0" E3-E9 by sex and month
NEAS model (Retirement losses)			
Pull Planned retirements of most recent Seq #	Impromptu Pull	Planned Retire Pull	
Update historical monthly retirement phase	G/L cube	Retirement monthly spread	Use TFDW for monthly loss projections
NEAS losses (Category losses)			
Pull 3-4 years of category losses by month	G/L cube	NEAS category losses by month	Filter out any officer loss/gain info

Table 79. Process checklist with source data and reference notes (continued)

Process	Data source	Source	Notes
Pull 3-4 Yrs of category losses by grade	G/L cube	NEAS category losses by grade	Filter out any officer loss/gain info
Pull 3 year soft total NEAS losses by month	G/L cube	NEAS losses by month	Used to compare to straight average
Pull 3 year soft total NEAS losses by grade	G/L cube	NEAS losses by grade	Used to determine likely grade spread
EAS model			
Pull EAS pop from TFDW	TFDSW	FY0X EAS POP with YOS TFDW	Update pull with date window
Confirm Tour II Cap	MMEA-1	MMEA-1	Usually 250-300
Confirm xYR FTAP extension cap	MMEA-6	MMEA-6	Usually 50-100
Confirm total FTAP number (include quality BS)	SRB planner	SRB planner	Usually 5,900-6,200
Confirm double count # (PSEPS accession credits)	1st term planner	1st term planner	MCRC and first term planner
Update reenlistment grade spread			Determines "stayers" grade spread
Determine discount rates and time periods for forecast	G/L cube	EAS discount rates	Apply as necessary and update
Update EAS cont rates from Rouillard table	Rouillard file	Rouillard EAS continuation rates	Use at least three years
Updated EAS grade spread rates			
Pull EAS cluster report/determine likely carryover	TFDW/ ODSE	EAS cluster report	Determine carryover based on 30 September date
Determine FTAP spread			Determine what month stayers come from
Gains			
Pull all gains by month (broken, continuous, other, deserter, EAD)	G/L cube	Gains by month	Project with WAG and Monte Carlo methods
Pull all gains by grade (broken, continuous, other, deserter, EAD)	G/L cube	Gains by grade	Update grade distro
Other losses			
Talk with SAIC to forecast	G/L cube	Other losses	Project with WAG and Monte Carlo methods

Table 79. Process checklist with source data and reference notes (continued)

Process	Data source	Source	Notes
Enlisted to Officer losses			
MCRC provides via OPS (OCC numbers)	MCRC		Must forecast attrition; women officers (WO); MCEP; ECP;
Get warrant officers numbers from OPS (usually 235) and attrition	OPS	OPS gives distro	All WO classes meet in Feb.
Get MCEP and EDP breakout from OPS	OPS		
Break out ECP and MCP for OCC losses but not OCC gains	OPS	OPS gives distro	MCRC & OPS
Get expected OCS attrition form OPS	OPS		
Enlisted to officer gains			
MCRC provides with OPS	MCRC		Only include OCCs. Never include enlisted Marines going to OCS as a gain--already enlisted!
Adjustments			
Determine likely accession carry-over from 30 Sept date	MCRC		Get shipping plan from MCRC
Insert safety margin	Delphi model		Pure art
Miscellaneous			
Project death (for reporting)	G/L cube		Project with WAG and Monte Carlo methods
Use correct ES for each FY	ES planner		Confirm
Check top six rate correct	ES planner		Enlisted Grade Structure Review (EGSR) Rate
Does ES match in plan	ES planner		Confirm
Are notes updated	ES planner		Confirm
Is female accession set to support 6% of population	ES planner		Confirm
Are promotion board information and dates correct?	Promotion planner	Promotion planner	Get dates and board sizes
Check t5op 6 percent as per EGSR for each year	ES planner		EGSR rate
Update metrics in ES model	ES planner		Forecast accuracy metrics

List of figures

List of tables